United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with the United States Department of Agriculture, Forest Service; United States Department of the Interior, Bureau of Land Management; and Montana Agricultural Experiment Station

MT011—Soil Survey of Carter County, Montana

Part I

The original maps and tables have been deleted from this online version. Since the soil survey's publication, more data on soil properties may have been collected, new interpretations developed, or existing interpretive criteria modified. Maps and current data tables can be accessed through the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/).

How to Use This Soil Survey

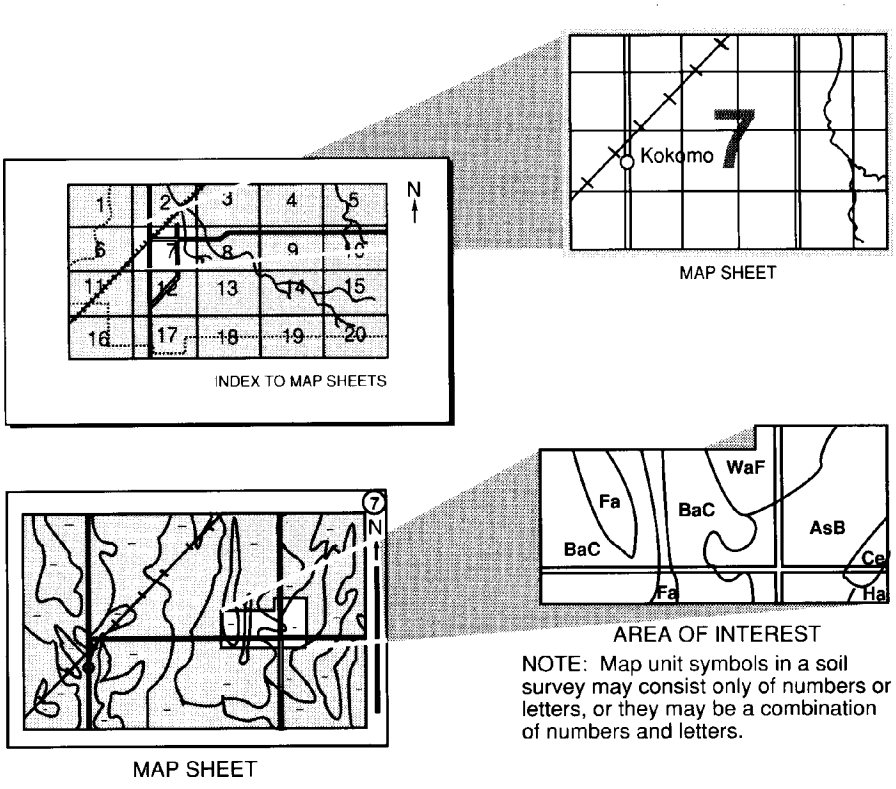
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, you can locate the Section, Township, and Range by zooming in on the **Index to Map Sheets**, or you can go to the Web Soil Survey at (http://websoilsurvey.nrcs.usda.gov/app/).

Note the map unit symbols that are in that area. The **Contents** lists the map units by symbol and name and shows the page where each map unit is described.

See the Contents for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies, including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the United States Department of Agriculture, Natural Resources Conservation Service and Forest Service; United States Department of the Interior, Bureau of Land Management; and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Carter County Conservation District.

The most current official data are available through the NRCS Soil Data Mart website at http://soildatamart.nrcs.usda.gov. Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Archin soils are in the foreground with the Long Pines in the background.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

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Part I

For tables with the most current data, please visit the Soil Data Mart at **http://soildatamart.nrcs.usda.gov/.**

Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Dave White
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Carter County, Montana

Fieldwork by Richard G. Bandy, Gary F. Berger, James F. Dorr, John A. Lindahl, Dan L. McLean, William R. Johnson, and Kenneth T. Scalzone, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the United States Department of Agriculture, Forest Service; United States Department of the Interior, Bureau of Land Management; and the Montana Agricultural Experiment Station

Carter County is located in southeastern Montana (fig. 1). It has a land area of 2,139,300 acres, or 3,342 square miles. Nearly a third of the county consists of Federal land.

The major occupations in Carter County are ranching and dryland farming. The county is the largest producer of sheep and lambs in Montana. About 10 percent of the county is used for dryland farming, with the majority used mainly for range.

Elevations range from 2,760 to 4,450 feet. The annual precipitation ranges from 12 to 17 inches, and the frost-free period ranges from 110 to 130 days.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent survey areas. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, and the extent of soils within the survey.

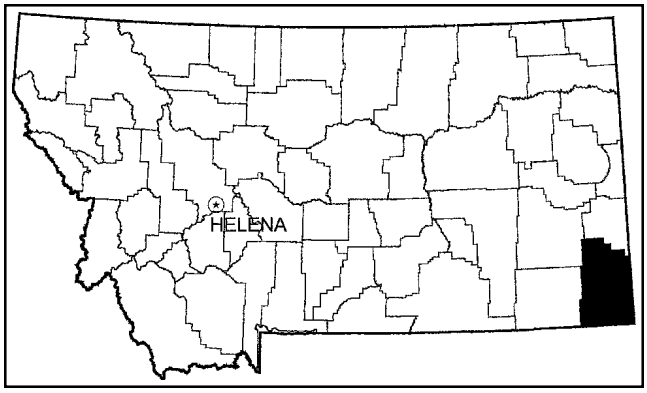

Figure 1.—Location of Carter County, Montana

General Nature of the Survey Area

This section describes some of the environmental and cultural features that affect the use and management of soils in the survey area. These features are history, industry and recreation, physiography and drainage, geology, mineral resources, ground-water resources, and climate.

History

The first known inhabitants of Carter County were Native American hunters who followed bison herds into the area.

Carter County was established in 1917 and was named in honor of Thomas Henry Carter, Montana's first representative to Congress. Ekalaka, the county seat, is located in the north-central part of the county and is the largest town. The other town of significant population is Alzada, located in the southern part of the county.

Carter County is located in an area known as the rolling prairie. In 1882, the first herd of cattle was trailed from Texas to Box Elder Creek. In 1897, the first school in the county was built near Ekalaka. In late 1908, the Chicago, Milwaukee, St. Paul, and Pacific Railroad was completed through the town of Baker, located 36 miles north of Ekalaka in Fallon County. Baker became the main freight station and point of departure for hundreds of homesteaders seeking plots of land to make their fortunes.

Schoolhouses became a part of every community, and many post offices were established, generally in ranch or farm homes. In the 1930s, hard times hit and many homesteads were abandoned.

Industry and Recreation

Raising livestock, growing crops, and mining bentonite are the principal industries in Carter County. Livestock operations, primarily cow-calf and sheep, account for nearly 82 percent of the farm income. The main dryland-farming crop is winter wheat. Other crops, such as spring wheat, barley, and grass hay, are also grown. Some alfalfa and grass hay are grown on waterspreading systems, which are located along Beaver and Box Elder Creeks and the Little Missouri River.

Livestock auction yards in Baker and Miles City, Montana, and Belle Fourche, South Dakota, provide ranchers with good livestock marketing facilities. Some of the calves are sold directly from the ranch to feeder buyers. Nearly all of the small grain produced is marketed through elevators in Baker, Miles City, and Belle Fourche.

The Alzada area is an important bentonite mining area. The bentonite produced here is shipped via truck to the Colony, Wyoming, area for refining.

Carter County offers numerous opportunities for outdoor recreation. Mule deer, white-tailed deer, and antelope populations, along with upland game birds, such as Merriam's turkey, sage grouse, sharp-tailed grouse, and Hungarian partridge, create excellent hunting opportunities. Many small ponds provide good fishing.

Medicine Rocks State Park and the abundance of forested lands in the county provide tremendous opportunity for camping, picnicking, hiking, and photography. The Carter County Historical Museum is renown for its paleontological collections and early human artifacts.

Physiography and Drainage

Mary Marshall Garsjo, State Geologist, Natural Resources Conservation Service, prepared the Physiography and Drainage, Geology, Mineral Resources, and Ground-water Resources sections.

The entire county is located within the Missouri Plateau physiographic province. The county is divided into two physiographic subprovinces by a northwest-trending line that runs through the center. This line separates the Montana Plains Province to the north from the Central Rocky Mountain Foreland Province to the south. The Black Hills Uplift begins in the southeast corner of the county and extends into the Black Hills of Wyoming and South Dakota.

The county consists predominantly of gently rolling plains with shallow creek valleys and broad flat divides. The landscape is semiarid with infrequent badland areas. Remnants of younger, relatively resistant sandstone formations form the prominent pinnacles and ridges of the Ekalaka Hills, Long Pine Hills, and Chalk Buttes. Landscapes typical in the northeastern part of the county are flat-topped buttes and summits capped by sandstone or resistant baked shale and clinker (scoria) beds. Topography in the central portion of the county is more subdued, containing large flat areas with little relief.

Relatively resistant reddish baked shale beds can be seen capping summits in the northeastern part of the county; these beds were formed by burning underground coal seams. Burning coal baked the surrounding sediments and made them more resistant to erosion.

In this semiarid climate, landscape is directly controlled by the characteristics of underlying bedrock. Elevations range from a low of 2,760 feet above sea level to a high of 4,450 feet. The lowest point is located where Spring Creek exits the county at the western county line. West Butte, located 6 miles north of the southwestern corner, is the highest point in the county.

The major northeast flowing drainages are Box Elder Creek and the Little Missouri River. Box Elder Creek drains the central portion of the county. It is perennial north of the town of Ridgway. The Little Missouri River is located to the southeast of Box Elder Creek and is perennial throughout Carter County. The northwestern corner of the county is drained by O'Fallon Creek, draining to the northwest. The extreme southeastern corner drains southeast, toward the Belle Fourche River, which is located in Wyoming and South Dakota.

Major streams, with numerous ephemeral tributaries arranged in a relatively linear dendritic pattern, follow meandering courses in wide, nearly level valley bottoms. The pattern is approximately parallel to the strike of the formations.

Geology

The oldest rocks exposed in Carter County belong to sedimentary formations deposited during the Cretaceous Period. At that time, a transcontinental sea covered the area between the Gulf of Mexico and the Arctic Ocean. Thick sequences of sediments were deposited on coastal plains and shallow sea floors during alternating periods of emergence and

submergence. These repeated marine invasions created a thick sequence of marine shales deposited on the sea floor. Brackish shales, freshwater shales, and sandstones were deposited on the coastal plains. These sandstone and shale beds grade both vertically and horizontally into each other.

Marine migrations continued without interruption until the Late Cretaceous Period, when uplift of the Rocky Mountains began in western Montana. Marine deposition ended in Carter County at the end of Pierre Shale time. The overlying Hell Creek Formation was the last unit to be deposited in the Late Cretaceous Period. The extinction of dinosaurs, approximately 65-million years ago, marked the end of the Cretaceous Period. At this time, fossils changed dramatically, but the character of the sediments remained the same.

Volcanism occurring to the west, during the Cretaceous Period, spread thick layers of volcanic ash over the area. Bentonite, which is derived from devitrified volcanic ash, occurs in many of the Cretaceous sediments, particularly the marine shales. Bentonite is found in layers from a few inches thick to mineable beds with thicknesses up to 10 feet.

Deposition of massive amounts of sediment from the Rocky Mountain Uplift continued during the Tertiary Period. Sluggish rivers meandering across the coastal plains deposited these sediments. The coastal plains were swampy and covered with lush vegetation. These marshes were eventually buried by accumulating sediments and converted to coal.

Approximately 50-million years ago, uplift and granitic intrusions occurred in the Black Hills area to the southeast. This igneous activity was accompanied by regional folding and faulting, including the formation of the Cedar Creek anticline and the adjacent Ekalaka syncline, between the Powder River Basin and the Williston Basin, and the Black Hills Uplift to the east of the Power River Basin. The Black Hills Uplift domed the overlying sedimentary formations upward as it rose. These sediments currently surround it in a concentric pattern of decreasing age. In general, rocks of southern Carter County influenced by the Black Hills Uplift occur in an arcuate pattern typical of an anticlinal fold, with age decreasing to the north.

Summarized below and listed in order of decreasing age is the sequence of exposed rocks for the county. Classification of rock units based on their lithology is group, formation, and member, from largest to smallest. For example, formations are subdivided into members. “Systems” refers to the rocks deposited during a particular geologic period.

Cretaceous System (135- to 65-million years before present): The oldest rocks exposed in Carter County belong to the Colorado Group. This group is approximately 2,000-feet thick and is composed of formations that are primarily marine shale. Formations of the Colorado Group are exposed in an arcuate pattern in the south-central portion of the county. In order of decreasing age, these formations include the Thermopolis Formation, with its upper Newcastle Sandstone Member; Mowry Shale; Belle Fourche Shale; Greenhorn Formation; Carlile Shale; and the Niobrara Formation.

Formations in the Colorado Group consist primarily of shale with smaller amounts of interbedded sandstone, siltstone, and marl (a calcareous shale). Most of these formations contain limestone and iron concretions. Bentonite occurs in beds from a few inches to several feet thick. The Gerdrum, Marvan, and Neldore soil series typically are derived from this group.

Directly overlying the Colorado Group is the Pierre Shale. It occupies most of central Carter County, between Cottonwood and Big Ramme Creeks. The Pierre Shale is 1,500- to 2,000-feet thick and consists primarily of dark gray marine shale. Interbedded in the shale are bentonite beds, iron concretions, limestone concretions, veins and crystals of gypsum, and local sandstone lenses. Many saline pan spots are associated with this formation. On the weathered exposures, gypsum crystals glitter in the sun like broken glass. Small lenses of clean, rounded quartz pebbles, weathered from the Pierre Shale, can be found capping small rises. The Gerdrum, Marvan, and Neldore soil series are also typically derived from this formation.

The overlying Fox Hills Sandstone consists of cross-bedded sandstone, siltstone, and shale from marine and brackish water deposits. It is 25- to 100-feet thick and crops out in a relatively narrow band surrounding the Pierre Shale. The upper member of the Fox Hills Sandstone is the Colgate Member. It is a light-colored, permeable sandstone that is distinct from the darker underlying material. The Colgate Member is locally thin or absent. The formation becomes more shaly downward and grades into the underlying Pierre Shale. The Blacksheep and Twilight soil series typically are derived from this formation.

The Hell Creek Formation overlies the Fox Hills Sandstone, ranging from 20- to 30-feet thick in this area. This formation consists of nonmarine and brackish water deposits of sandstone and shale and contains the last of the dinosaur fossils. Together with

the underlying Colgate Member, this formation becomes sandier downward and forms a relatively thick and continuous aquifer. This aquifer supplies much of the domestic and stock water in the region. The Archin, Eapa, and Ynot soil series typically are derived from this formation.

Tertiary System (65- to 2.5-million years before present): The Fort Union Formation overlies the Hell Creek Formation and is exposed in the northeastern part of the county. This formation covers a large portion of eastern Montana but does not occur in significant quantities in Carter County. In this area, the Fort Union Formation has a maximum thickness of 1,800 feet and has been subdivided into the lower Ludlow Member and the upper Tongue River Member. Like the Hell Creek Formation, the Fort Union Formation consists of sandstone, shale, and coal beds. Brick red summits and shoulders of hills formed from baked shale give the outcrops a distinctive appearance. Thin sandy soils mantle the sandstone summits. Deeper soils occur on the intermediate valleys that are eroded into shales. There are 6- to 12-feet thick gravel terraces associated with this formation. The gravels of these terraces are both cleaner and younger than the gravels associated with the Pierre Shale.

In most of the Tongue River Member, shale occurs more frequently than sandstone; however, shale weathers more rapidly into soil-covered slopes and is not as conspicuous as the sandstone. The Tongue River Member is the chief coal-bearing formation in eastern Montana and contains many thick coal beds. The Cabbart, Cambeth, and Eapa soil series typically are derived from this member. The Kirby soil series developed on the baked shale.

The Ludlow Member consists of interbedded sandstone, siltstone, and shale and weathers to badlands-like topography. In other areas of Montana, the Ludlow Member is subdivided into the upper Lebo Shale and lower Tullock Members. Coal in the Ludlow Member occurs as thin lenticular beds. The Archin, Bonfri, and Chinook soil series typically are derived from this member.

Directly overlying the Tongue River Member, the White River Group is exposed only in small areas of higher hills. This group is subdivided into two formations, the older Chadron Formation and the overlying Brule Formation. They crop out in the summits and pinnacles of Long Pine Hills as small exposures overlying the Tongue River. The White River Group is more widely distributed in South Dakota and does not occur in other areas of Montana.

The Chadron Formation consists of interbedded conglomerate and limestone with sandstone and pale green bentonitic shales. The overlying Brule Formation consists of massive orange and pink tuffaceous siltstone with interbeds of shale and sandstone. The White River Group has relatively high permeability but is generally not considered an aquifer because of its limited recharge area.

The Arikaree Formation overlies the White River Group in the Ekalaka Hills and has a wider distribution in South Dakota and Wyoming. This formation is up to 250-feet thick and forms resistant bluffs in the southern margin of the Ekalaka Hills, Long Pine Hills, and Chalk Buttes. The Arikaree Formation consists of light-colored tuffaceous sandstone and shales with interbedded volcanic ash and is locally capped by hard green quartzite. The Belltower, Dast, and Vebar soil series typically are derived from this formation.

Slump areas are located at the base of the Ekalaka Hills, Long Pine Hills, and Chalk Buttes. These areas are composed of both Tertiary- and Cretaceous-aged sedimentary rocks. Most of this movement occurred in the Miocene Epoch (mid-Tertiary Period). The Miocene Epoch was more humid than the contemporary climate. This additional moisture compounded generally unstable conditions in the Brule Formation. The resulting soils have been mapped in the Haploboroll and Ustochrept families.

At the north end of the county, Medicine Rocks State Park consists of unusual and spectacular geology. The park contains knobs and ridges that formed in the soft erodible sandstone of the Tongue River Member. These features are considered remnants of an old dune field that were shaped by wind erosion. Like contemporary dune fields, the sand grains are small and uniform and have a crossbedded structure.

Mineral Resources

Carter County is located within eastern Montana's oil and gas producing region. Oil and gas are produced from different stratigraphic horizons. Oil and gas accumulation is a factor of both geologic structure and porosity variations within individual formations.

Two oil and gas fields have been developed in the county. Hammond Field is located northwest of Alzada, and Repeat Field is located south of the Humbolt Hills near the South Dakota border.

In the Repeat Field, oil and associated gas are produced from the Red River Formation. This

formation is of mid-Ordovician-age and consists of limestone and dolomite. The Red River Formation is one of the most widespread formations in the Williston Basin and is one of its main hydrocarbon reservoirs. The Repeat Field is associated with the Fallon County fields along the crest of the Cedar Creek anticline to the east.

Hammond Field produced natural gas from the Muddy Sandstone Member of the lower Cretaceous Colorado Group. In the past several years, there has not been any production from this field.

Carter County contains significant exposures of formations that are known to contain mineable beds of bentonite. Bentonite beds occur in the Arikaree Formation, the Monument Hill Bentonitic Member of the Pierre Formation, and the Belle Fourche and Mowry Shales.

Potentially economic deposits of lignite are present in Carter County. Lignite is soft and crumbly and contains significant moisture. It has the lowest heat content of coal types. These deposits have undergone little development. They occur in relatively thin, less than 10-feet thick, beds in the Tongue River Member. A few thin beds also occur in the underlying Ludlow Member and Hell Creek Formation.

The Ekalaka Lignite Field produced 2,250 tons of lignite between 1926 and 1934. There has been no further reported development of this field.

Current economic geology maps do not designate “strippable coal reserves” in Carter County. Minor amounts of uranium have been found in lignite beds that crop out along the Ekalaka Hills and Long Pine Hills. Uranium was leached by ground water from windblown tuffs or weathered igneous rocks and deposited in organic-rich lignite. Most uranium in the county has been found in the Fort Union Formation and the overlying Arikaree Formation. Uranium also occurs at depth in lower Cretaceous Formations that do not crop out in the area.

Aggregate, such as sand and gravel, used to make concrete occur in mineable quantities within the county.

Ground-water Resources

Usable ground-water aquifers occur at the surface only in the northern and northeastern portions of Carter County. The remaining shale formations, exposed to the south, are generally impermeable. They contain only small amounts of saline water, which is often too mineralized for any use. Drill depths to underlying artesian aquifers can be quite deep.

Sandstone beds occur In the Pierre Formation and the underlying Newcastle, Muddy, and Lakota Sandstones. Deep wells have been successfully completed in these sandstone beds. Because of structural configuration, wells occur under artesian conditions. Some wells may flow depending on their location.

Ground water in northern Carter County is obtained primarily from the Fox Hills-Lower Hell Creek aquifer wherever the overlying Fort Union Formation is not too thick. Total dissolved solids concentration from this aquifer are generally low, ranging from well under 500 to 2,000 mg/l. The best quality water is found near recharge areas. Average yields are 10 gallons-per-minute (gpm), though yields of as high as 40 gpm are possible.

In the Fort Union Formation, the Tongue River Member typically yields 8 to 15 gpm, and the more shaly Ludlow Member typically yields 3 to 8 gpm. Water is produced from frequently occurring sandstone and baked shale beds. These beds occur as discontinuous lenses with limited areal extent. Their exact locations are impossible to predict at a particular site. After years of use, shallow wells often fail when the limited sandstone lens is completely drained.

Water in the Fort Union Formation contains total dissolved solids concentrations (TDS) ranging from 400 to 2,000 mg/l. In general, the best quality water is obtained from baked shale beds. The Environmental Protection Agency has recommended a maximum TDS concentration of 500 mg/l for human consumption. Water with greater than 7,000 mg/l TDS is generally considered unfit for any use.

Unconsolidated deposits of alluvium occur in the valleys of larger streams. These deposits, consisting of interbedded clay, silt, sand, and gravel, have thicknesses up to 50 feet and are commonly used for ground-water development. They produce average yields of 15 gpm. TDS concentrations range from 450 to 6,000 mg/l.

The Montana Bureau of Mines and Geology’s Open File Report HY77-1, Compilation of Hydrogeological Data for Southeastern Montana, reported a total of 867 wells in Carter County in 1977.

Their average depth was 172 feet, with average static water levels of 72 feet. In 70 percent of the wells, static water level was less than 160 feet.

Well use current to April 1991 is summarized below. Often wells have multiple uses and are listed under both domestic and stockwater supplies, causing the total to appear less than the sum of the uses. This information was provided by the Montana Groundwater Information Center, Butte, Montana.

Stockwater	918
Household and Domestic	239
Unknown	33
Other	3
Industrial	2
Unused	1
TOTAL WELLS	1,089

Climate

Following this section are tables giving data on temperature and precipitation, probable dates of the first freeze in fall and the last freeze in spring, and data on length of the growing season.

Growing-degree days are the equivalent to “heat units.” During the month, growing-degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. This information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the survey area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, soil scientists develop a concept, or model, of how the soils were formed. During mapping, this model enables soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size, and shape of soil aggregates; kind and amount of rock fragments; distribution of plant roots; reaction; and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret data from these analyses and tests as well as field-observed characteristics and soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled

from other sources, such as research information, production records, and field experience of specialists. For example, data for crop yields under high levels of management are modeled and validated with farm records and field or plot information on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Descriptions, names, and delineations of the soils in this survey area may not fully agree with those of the soils in adjacent survey areas. Differences result from a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Temperature and Precipitation

(Recorded in the period 1964-1994 at Albion, Ekalaka, and Ridgway)

Month	Temperature (Degrees F)					Precipitation (Inches)					
	Average Daily Maximum	Average Daily Minimum	Average	2 years in 10 Will Have— Maximum Temperature More Than	2 years in 10 Will Have— Minimum Temperature Less Than	Average Number of Growing Degree Days*	Average	2 years in 10 Will Have— Less Than	2 years in 10 Will Have— More Than	Average Number of Days With 0.10 or More	Average Total Snowfall
ALBION:											
January----	28.5	1.0	14.8	54	-36	1	0.28	0.11	0.46	1	3.0
February---	34.4	6.3	20.3	62	-31	5	0.28	0.07	0.47	0	3.2
March------	44.9	17.6	31.2	72	-14	23	0.51	0.26	0.82	1	3.7
April------	57.0	28.2	42.6	84	6	122	1.56	0.51	2.41	3	6.9
May--------	68.4	38.9	53.7	91	19	371	2.12	1.13	2.99	5	0.6
June-------	76.7	47.9	62.3	99	32	608	3.15	1.95	4.23	7	0.0
July-------	86.1	53.0	69.5	104	37	827	1.82	0.57	2.83	4	0.0
August-----	85.7	50.2	68.0	104	32	737	1.28	0.40	2.00	2	0.0
September--	74.3	39.1	56.7	100	20	435	0.99	0.35	1.58	3	0.6
October----	60.8	28.1	44.5	87	2	171	1.12	0.40	1.80	2	0.7
November---	41.8	15.3	28.5	70	-19	15	0.42	0.16	0.63	1	3.4
December---	32.5	5.1	18.8	61	-31	2	0.41	0.16	0.65	1	4.7
Yearly:											
Average---	57.6	27.6	42.6	———	———	———	———	———	———	———	———
Extreme---	108.0	-48.0	———	106	-38	———	———	———	———	———	———
Total-----	———	———	———	———	———	3,316	13.93	8.88	16.10	30	26.8
EKALAKA:											
January----	29.5	6.9	18.2	56	-30	3	0.53	0.22	0.78	1	0.0
February---	34.9	12.4	23.7	59	-25	7	0.44	0.17	0.69	1	0.5
March------	44.2	20.5	32.4	71	-14	44	0.71	0.29	1.07	2	1.1
April------	57.1	30.8	43.9	82	6	181	1.77	0.76	2.64	4	0.1
May--------	68.3	40.9	54.6	90	20	448	2.57	1.28	3.69	5	0.0
June-------	77.4	49.6	63.5	96	33	698	3.64	2.10	5.01	6	0.0
July-------	85.6	55.4	70.5	101	39	936	1.77	0.68	2.69	3	0.0
August-----	84.0	53.3	68.6	99	34	875	1.24	0.41	2.00	3	0.0
September--	72.0	42.7	57.3	96	22	512	1.57	0.43	2.48	3	0.0
October----	59.3	31.9	45.6	83	6	229	1.32	0.52	2.06	2	0.3
November---	42.1	19.7	30.9	70	-12	34	0.68	0.24	1.04	2	2.7
December---	32.1	10.2	21.2	59	-29	6	0.63	0.22	0.97	2	2.6
Yearly:											
Average---	57.2	31.2	44.2	———	———	———	———	———	———	———	———
Extreme---	105.0	-43.0	———	102	-34	———	———	———	———	———	———
Total-----	———	———	———	———	———	3,973	16.87	12.78	20.16	34	7.4

See footnote at end of table.

Temperature and Precipitation--Continued

Month	Temperature (Degrees F)					Precipitation (Inches)					
	Average Daily Maximum	Average Daily Minimum	Average	2 years in 10 Will Have— Maximum Temperature More Than	2 years in 10 Will Have— Minimum Temperature Less Than	Average Number of Growing Degree Days*	Average	2 years in 10 Will Have— Less Than	2 years in 10 Will Have— More Than	Average Number of Days With 0.10 or More	Average Total Snowfall
RIDGWAY:											
January----	28.7	3.0	15.8	54	-32	1	0.32	0.17	0.62	1	5.1
February---	34.2	8.8	21.5	59	-29	4	0.28	0.09	0.50	1	4.3
March------	43.7	19.1	31.4	72	-16	30	0.68	0.18	1.17	1	6.9
April------	57.0	30.5	43.8	83	8	169	1.51	0.60	2.28	4	4.3
May--------	67.7	40.6	54.2	90	21	430	2.30	0.95	3.45	5	0.4
June-------	76.6	49.6	63.1	97	32	663	2.69	1.74	3.54	6	0.1
July-------	85.0	55.5	70.3	102	39	881	1.69	0.66	2.56	4	0.0
August-----	84.2	52.8	68.5	100	34	832	1.04	0.53	1.61	2	0.0
September--	72.6	41.3	56.9	97	20	490	1.21	0.39	2.03	3	0.8
October----	60.2	29.8	45.0	85	3	201	1.01	0.34	1.69	2	1.7
November---	42.5	16.8	29.7	72	-17	26	0.53	0.19	0.95	1	4.7
December---	32.0	6.3	19.1	59	-34	2	0.48	0.19	0.87	1	5.4
Yearly:											
Average---	57.0	29.5	43.3	———	———	———	———	———	———	———	———
Extreme---	108.0	-51.0	———	103	-39	———	———	———	———	———	———
Total-----	———	———	———	———	———	3,728	13.75	10.39	16.35	31	33.7

* A growing-degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold: 40.0 degrees F).

Freeze Dates in Spring and Fall

(Recorded in the period 1964-1994 at Albion, Ekalaka, and Ridgway)

Probability	Temperature		
	24 Degrees F or Lower	28 Degrees F or Lower	32 Degrees F or Lower
ALBION:			
Last freezing temperature in spring: January-July			
1 year in 10 later than-------	May 16	May 31	June 7
2 years in 10 later than------	May 12	May 25	June 2
5 years in 10 later than------	May 2	May 13	May 24
First freezing temperature in fall: August-December			
1 year in 10 earlier than-----	September 13	September 4	August 27
2 years in 10 earlier than----	September 18	September 8	August 31
5 years in 10 earlier than----	September 28	September 17	September 10
EKALAKA:			
Last freezing temperature in spring: January-July			
1 year in 10 later than-------	May 10	May 20	June 6
2 years in 10 later than------	May 5	May 15	June 1
5 years in 10 later than------	April 25	May 5	May 21
First freezing temperature in fall: August-December			
1 year in 10 earlier than-----	September 16	September 9	September 1
2 years in 10 earlier than----	September 22	September 14	September 6
5 years in 10 earlier than----	October 4	September 25	September 16

Freeze Dates in Spring and Fall--Continued

Probability	Temperature		
	24 Degrees F or Lower	28 Degrees F or Lower	32 Degrees F or Lower
RIDGWAY:			
Last freezing temperature in spring: January-July			
1 year in 10 later than-------	May 16	May 24	June 6
2 years in 10 later than------	May 10	May 18	May 31
5 years in 10 later than------	April 28	May 8	May 20
First freezing temperature in fall: August-December			
1 year in 10 earlier than-----	September 16	September 7	August 26
2 years in 10 earlier than----	September 21	September 12	September 1
5 years in 10 earlier than----	October 3	September 22	September 11

Growing Season

(Recorded in the period 1964-1994 at Albion, Ekalaka, and Ridgway)

Probability	Daily Minimum Temperature		
	Higher Than 24 Degrees F	Higher Than 28 Degrees F	Higher Than 32 Degrees F
	Days	*Days*	*Days*
ALBION:			
9 years in 10	126	104	86
8 years in 10	133	111	95
5 years in 10	148	125	112
2 years in 10	163	138	129
1 year in 10	170	145	138
EKALAKA:			
9 years in 10	138	120	94
8 years in 10	146	128	102
5 years in 10	161	142	117
2 years in 10	177	157	132
1 year in 10	184	164	140
RIDGWAY:			
9 years in 10	130	112	91
8 years in 10	139	121	99
5 years in 10	157	136	115
2 years in 10	175	152	130
1 year in 10	184	160	138

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification. The tables, "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," at the end of this section show the classification and extent of the soils in this survey area.

Formation of the Soils

Soil is a natural, three-dimensional body on the earth's surface. Soil has properties that result from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over a period of time.

Although there are many different soils, each soil is the result of the interaction of the same five factors. These factors are the effect of climate on the parent material, the kinds of plants and organisms living in the soil, the relief of the land, the physical and chemical composition of the parent material, and the length of time it took for the soil to form.

Within short distances, the combination of these factors varies, and, consequently, the soils that form differ in fertility, productivity, and physical and chemical characteristics. In the following paragraphs, the factors of soil formation are discussed as they relate to the soils in the survey area.

Climate

Temperature and precipitation mainly determine climate, an active force in the formation of soils. Soils form in rocks that have been broken into suitable materials by erosion and alternate freezing and thawing. Chemical reactions, such as solution and hydration, further break down this weathered material. Water and wind are active agents in transporting and separating weathered material.

Precipitation and temperature affect the kind and amount of vegetation that grows on the soil. Vegetation decays to produce organic matter in the soil. Soils that have cool temperatures and high precipitation, such as the Parshall series, generally contain more organic matter and are dark colored. Soils that have warm temperatures and low precipitation, such as the Yamacall series, generally contain less organic matter and are light colored. In Carter County, precipitation ranges from 10 to 19 inches annually.

Living Organisms

Living organisms are active in the formation of soils. Among the earliest inhabitants of rock material, fungi and algae contribute to the decomposition of bedrock. As rocks decompose, grasses, shrubs, and trees are able to grow and support animal life.

Organic matter is the main source of the dark color of the surface layer. The kinds of plants and animals in an area largely determine the kind and amount of organic matter added to the soil and the manner in which this matter is incorporated into mineral parts of the soil. Plants, animals, insects, and microorganisms affect gains or losses in organic matter, plant nutrients, and changes in porosity and structure. Roots, rodents, and insects penetrate the soil and influence its structure. Microorganisms, chemicals in the soil, and insects change leaves, roots, and entire plants that remain in the surface layer to humus.

Animals increase porosity by burrowing through the soil and leaving open channels for the movement of water and air. Common burrowing animals are badger, field mice, ground squirrel, prairie dog, and rabbit. Burrowing rodents brought up many of the pebbles and cobbles on the surface of terraces.

Native vegetation in Carter County consists mainly of short and mid grasses, forbs, and shrubs.

Topography

Topography, or relief, is determined by the resistance of bedrock or soil material to water erosion and soil blowing. Topography influences soil development through its effect on drainage and runoff. On eroded uplands in the survey area, runoff water has carved deep intermittent drains with many branches into the original bedrock formations. This

rugged relief contrasts sharply with the smooth low relief of terraces and flood plains.

On uplands, the number and distinctness of soil horizons generally decrease as the slope increases. Soils on steep slopes that have rapid runoff have many characteristics similar to those of soils formed in arid climates. Nearly level to gently rolling soils have many characteristics similar to those of soils formed in semiarid climates. Examples of these patterns, typical in Carter County, are the shallow Blacksheep soil that has strongly sloping to steep slopes and no B horizon and the nearly level to gently rolling Eapa soil that is very deep with a 7- to 24-inch thick B horizon.

Parent Material

Most soils in Carter County formed in place over semiconsolidated sedimentary beds or semiconsolidated shale. Many soils formed in alluvium and were deposited in valleys. Soils, such as the Blacksheep series, that formed in material derived from semiconsolidated, sandy sedimentary beds are generally sandy. Soils, such as the Bascovy series, that formed in shale are clayey, since clay is the basic constituent of shale. Soils, such as the Havre series, that formed in mixed alluvium derived from semiconsolidated, loamy sedimentary beds are loamy.

Many soils in the county, such as the Alona series, have acquired salt and sodium from their parent materials. Salt and sodium make these soils saline or alkaline and limit the kind and amount of plants able to grow on them. The density of the parent rock and its mineral composition can limit the rate of weathering and the depth of a soil.

Time

Change taking place in soils over a long period is called soil genesis. As a result of these changes, distinct horizons, or layers, develop in the soils. The length of time that parent materials have been in place and exposed to climate and living organisms is generally reflected in the degree to which the soil profile has developed. The kind and arrangement of these horizons are called soil morphology. These layers are described in terms of chemistry, color, consistence, permeability, structure, texture, and thickness.

Soils are classified according to their approximate age, from young to mature. Age or maturity of a soil is generally indicated by the thickness and distinctness of subsurface horizons, content of organic matter and clay, depth to which soluble material is leached, and form and distribution of calcium carbonate and gypsum in the soil.

Havre loam, a soil of the Entisol order, is a young soil that formed in alluvium on a flood plain. This soil contains little organic matter with which to form an A horizon. It has no clay accumulation and limited translocation of carbonates has occurred to form Bk horizons.

Eapa loam formed in parent material similar to, but much older than, that of the Havre soil. Eapa soil formed in alluvium on alluvial fans and stream terraces and is a mature soil of the Mollisol order. It contains enough organic matter to have a dark A horizon. Also, it has a distinct clay accumulation in the B horizon, and nearly all of the carbonates have been leached below a depth of about 24 inches.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1975 and 1990). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The table, “Classification of the Soils,” shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol, from *mollis*, meaning soft.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (*Bor*, meaning northern, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil.

An example is Argiboroll (*Argi*, meaning having an argillic or clay accumulation, plus *boroll*, the suborder of the Mollisols that are cool).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Argiborolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is Fine-loamy, mixed Typic Argiborolls.

SERIES. The series consists of soils within a family that have horizons similar in arrangement in the profile, color**,** consistence**,** mineral and chemical composition, reaction, structure, and texture**.** An example is the Reeder series, which is a Fine-loamy, mixed Typic Argiboroll.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each description is followed by the detailed soil map units associated with the series.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (Soil Survey Division Staff, 1962). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1975). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class, there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and, consequently, they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all of the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all of the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is

divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Glendive sandy loam, saline, 0 to 4 percent slopes, is a phase of the Glendive series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

This survey includes *complexes.* They consist of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Gerdrum-Absher complex, warm, 3 to 9 percent slopes, is an example.

This survey includes *miscellaneous areas*. They have little or no soil material and support little or no vegetation. Badland is an example.

The table, "Acreage and Proportionate Extent of the Soils," in Parts I and II of the manuscript gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. Many of the terms used in describing the soils or miscellaneous areas are defined in the "Glossary."

Abor Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated shale
Slope range: 2 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic, frigid Leptic Udic Haplusterts

Typical Pedon

Abor silty clay loam, 2 to 8 percent slopes, in an area of rangeland, 2,000 feet north and 250 feet west of the southeast corner of sec. 19, T. 6 S., R. 56 E.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium granular structure; hard, friable, very sticky, very plastic; many very fine roots; slightly alkaline; clear smooth boundary.

Bss—4 to 14 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, very sticky, very plastic; few very fine and fine roots; few slickensides; slightly effervescent; slightly alkaline; gradual wavy boundary.

Bssky—14 to 26 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky, very plastic; few very fine roots; few slickensides; few fine nests and seams of gypsum crystals; common fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

By—26 to 32 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; very hard, firm, very sticky, very plastic; few very fine roots; few fine masses and nests of gypsum; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cr—32 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated shale that crushes to silty clay and silty clay loam, grayish brown (2.5Y 5/2) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F (60 to 72 degrees F summer temperatures)
Depth to the Bssky horizon: 10 to 16 inches
Depth to the Cr horizon: 20 to 40 inches
Other features: When dry, this soil has 1/4- to 2-inch cracks that extend to a depth of about 20 inches.

A horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5, 6, or 7 dry; 4, 5, or 6 moist
- Chroma: 1 to 4 (The 1 chroma is inherent from the parent material.)
- Clay content: 35 to 40 percent
- Content of rock fragments: 0 to 10 percent pebbles
- Electrical conductivity: 0 to 4 mmhos/cm
- Reaction: pH 7.4 to 8.4

Bss horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5, 6, or 7 dry; 4, 5, or 6 moist
- Chroma: 1 to 4
- Texture: Silty clay, silty clay loam, or clay
- Clay content: 35 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.4 to 9.0

Bssky horizon
Hue: 2.5Y, 5Y, 10YR, or 2.5YR
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 1 to 4
Texture: Silty clay, silty clay loam, clay loam, or clay
Clay content: 35 to 60 percent
Slickensides: Few to common
Electrical conductivity: 0 to 4 mmhos/cm
Gypsum content: 1 to 5 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 9.0

By horizon
Hue: 2.5Y, 5Y, 10YR, or 2.5YR
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 1 to 4
Texture: Silty clay, silty clay loam, or clay
Clay content: 35 to 60 percent
Electrical conductivity: 0 to 4 mmhos/cm
Gypsum content: 1 to 5 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 9.0

51C—Abor silty clay loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Abor and similar soils: 85 percent

Minor Components
Gerdrum and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 4 percent
Neldore and similar soils: 0 to 4 percent
Weingart and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

251D—Abor-Yawdim silty clay loams, 4 to 15 percent slopes

Setting

Landform:
- Abor—Hills
- Yawdim—Hills

Position on landform:
- Abor—Backslopes
- Yawdim—Shoulders and summits

Slope:
- Abor—4 to 15 percent
- Yawdim—4 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Abor and similar soils: 60 percent
Yawdim and similar soils: 30 percent

Minor Components
Bascovy and similar soils: 0 to 3 percent
Marias and similar soils: 0 to 3 percent
Volborg and similar soils: 0 to 2 percent
Neldore and similar soils: 0 to 2 percent

Major Component Description

Abor
Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.6 inches

Yawdim
Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 2.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Absher Series

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 9 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Absher clay, in an area of Absher-Gerdrum complex, 0 to 4 percent slopes, in an area of rangeland, 650 feet north and 1,250 feet east of the southwest corner of sec. 25, T. 9 S., R. 59 E.

E—0 to 1 inch; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; moderate thin platy structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine tubular pores; slightly alkaline; abrupt smooth boundary.

Btn1—1 to 7 inches; light brownish gray (10YR 6/2) clay, brown (10YR 5/3) moist; moderate medium columnar structure parting to strong fine and medium subangular blocky; very hard, firm, moderately sticky, moderately plastic; few fine and many very fine roots; few very fine and fine pores; common faint clay films on faces of peds and in pores; moderately alkaline; clear smooth boundary.

Btn2—7 to 10 inches; pale brown (10YR 6/3) clay, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; few very fine and fine roots; few very fine pores; common faint clay films on faces of peds and in pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bknyz—10 to 24 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; few very fine roots; few very fine pores; common very fine and fine nests and seams of gypsum crystals; few fine seams of other salts; few fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bkyz—24 to 60 inches; very pale brown (10YR 7/3) clay, dark grayish brown (10YR 4/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; common very fine and fine nests of gypsum crystals; few very fine and fine seams of other salts; few fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F (60 to 68 degrees F summer temperatures)
Depth to the Bknyz horizon: 6 to 20 inches
Other features: In areas that are cultivated, a clay texture results from mixing the E and Bt horizons.
Taxonomic note: Map units 611B and 611D are taxadjuncts to the Absher series in order to join soils that have an average soil temperature greater than 47 degrees F.

E horizon
Hue: 2.5Y, 10YR, or 7.5YR
Value: 6 or 7 dry; 3, 4, or 5 moist
Chroma: 1 to 3
Texture: Clay when mixed to 7 inches
Clay content: 15 to 20 percent
Electrical conductivity: 4 to 8 mmhos/cm
Reaction: pH 6.6 to 8.4

Btn1 horizon
Hue: 2.5Y, 10YR, or 7.5YR
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Silty clay, clay, or clay loam
Clay content: 35 to 60 percent
Content of rock fragments: 0 to 15 percent pebbles
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 18 to 70
Reaction: pH 6.6 to 8.4

Btn2 horizon
Hue: 2.5Y, 10YR, or 7.5YR
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Silty clay, clay, or clay loam
Clay content: 35 to 60 percent

Content of rock fragments: 0 to 15 percent pebbles
Electrical conductivity: 4 to 8 mmhos/cm
Sodium adsorption ratio: 18 to 70
Reaction: pH 6.6 to 8.4

Bknyz and Bkyz horizons
Hue: 2.5Y, 10YR, or 7.5YR
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Clay loam, sandy clay loam, silty clay, clay, or silty clay loam
Clay content: 27 to 50 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 4 to 15 percent
Electrical conductivity: 16 to 30 mmhos/cm
Sodium adsorption ratio: 18 to 70
Gypsum content: 1 to 5 percent
Reaction: pH 7.9 to 9.6

168B—Absher-Gerdrum complex, 0 to 4 percent slopes

Setting

Landform:
- Absher—Alluvial fans and stream terraces
- Gerdrum—Alluvial fans and stream terraces

Position on landform:
- Absher—Microlows
- Gerdrum—Microhighs

Slope:
- Absher—0 to 4 percent
- Gerdrum—0 to 4 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Absher and similar soils: 60 percent
Gerdrum and similar soils: 30 percent

Minor Components
Creed and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 3 percent
Soils that have slopes more than 4 percent: 0 to 2 percent
Very deep nonsaline soils: 0 to 2 percent

Major Component Description

Absher
Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches

Gerdrum
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Alona Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 2 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-silty, mixed, frigid Aridic Ustochrepts

Typical Pedon

Alona silt loam, 2 to 8 percent slopes, in an area of rangeland, 800 feet north and 1,000 feet east of the southwest corner of sec. 1, T. 8 S., R. 59 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; 1/2- to 1-inch vesicular crust over moderate fine and medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular pores; slightly effervescent; slightly alkaline; clear smooth boundary.
Bw—3 to 10 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5 4/2) moist;

moderate medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular pores; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bk—10 to 22 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine roots; common very fine tubular pores; common very fine masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

Bkz—22 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine roots; few very fine pores; few fine nests and seams of salt crystals; common fine and medium masses of lime; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 6 to 18 inches
Soil phases: Warm
Taxonomic note: Map unit 621C is a taxadjunct to the Alona series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3, 4, or 5 moist
Chroma: 2 or 3
Clay content: 18 to 27 percent
Electrical conductivity: 2 to 4 mmhos/cm
Sodium adsorption ratio: 2 to 10
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bw horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3, 4, or 5 moist
Chroma: 2 to 4
Texture: Silt loam or silty clay loam
Clay content: 18 to 35 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 13 to 40
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 8.5 to 9.6

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 6 or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Silt loam or silty clay loam
Clay content: 18 to 35 percent
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 40
Reaction: pH 9.1 to 9.6

Bkz horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 6 or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, silty clay loam, or silt loam
Clay content: 18 to 35 percent
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 40
Reaction: pH 8.5 to 9.6

20C—Alona silt loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Alona and similar soils: 85 percent

Minor Components
Cambeth and similar soils: 0 to 4 percent
Soils that have darker colored surface layers: 0 to 4 percent
Very deep nonsaline soils: 0 to 4 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

621C—Alona silt loam, warm, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Alona and similar soils: 85 percent

Minor Components
Moderately deep loamy soils: 0 to 4 percent
Soils that have slopes more than 8 percent: 0 to 4 percent
Very deep, nonsaline soils: 0 to 4 percent
Soils that have darker colored surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Alzada Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 2 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, mixed, frigid Aridic Ustochrepts

Typical Pedon

Alzada clay loam, 2 to 8 percent slopes, in an area of rangeland, 2,200 feet north and 2,500 feet west of the southeast corner of sec. 24, T. 9 S., R. 58 E.

A—0 to 2 inches; light brownish gray (10YR 6/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; slightly acid; clear smooth boundary.

Bw—2 to 10 inches; brown (10YR 5/3) clay, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, very sticky, very plastic; common very fine roots; few very fine and fine pores; common faint clay films on faces of peds and in pores; disseminated lime; slightly effervescent; slightly alkaline; gradual smooth boundary.

Bk—10 to 16 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, very plastic; common very fine roots; few fine masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Bkyz—16 to 36 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure; hard, firm, moderately sticky, moderately plastic; many fine and medium nests and seams of gypsum crystals; few fine seams of other salts; few fine seams of lime; strongly effervescent; neutral; gradual wavy boundary.

2C—36 to 60 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; massive; hard, firm, moderately sticky, moderately plastic; neutral.

Range in Characteristics

Soil temperature: 43 to 47 degrees F
Depth to the Bk horizon: 8 to 16 inches
Depth to the 2Bkyz horizon: 12 to 22 inches

A horizon
Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 3, 4, or 5 moist
Chroma: 2 or 3
Texture: Clay loam when mixed to 7 inches

Clay content: 27 to 35 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 5.6 to 7.3

Bw horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Silty clay loam or clay
Clay content: 35 to 50 percent
Electrical conductivity: 0 to 2 mmhos/cm
Sodium adsorption ratio: 0 to 13
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Silty clay loam or clay
Clay content: 35 to 50 percent
Electrical conductivity: 0 to 2 mmhos/cm
Sodium adsorption ratio: 0 to 13
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

2Bkyz horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 1 or 2
Texture: Silty clay loam or clay
Clay content: 35 to 50 percent
Electrical conductivity: 4 to 8 mmhos/cm
Gypsum content: 1 to 5 percent
Reaction: pH 6.6 to 8.4

2C horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 1 or 2
Texture: Clay loam, silty clay loam, or clay
Clay content: 35 to 50 percent
Electrical conductivity: 4 to 8 mmhos/cm
Reaction: pH 6.6 to 8.4

92C—Alzada clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Alzada and similar soils: 85 percent

Minor Components
Gerdrum and similar soils: 0 to 3 percent
Neldore and similar soils: 0 to 3 percent
Teigen and similar soils: 0 to 3 percent
Very shallow soils: 0 to 3 percent
Soils that have slopes less than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Archin Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans, stream terraces, and sedimentary plains
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed Borollic Natrargids

Typical Pedon

Archin fine sandy loam, in an area of Archin-Absher complex, 2 to 8 percent slopes, in an area of rangeland, 1,700 feet south and 650 feet east of the northwest corner of sec. 14, T. 3 N., R. 56 E.

A—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine pores; neutral; clear smooth boundary.
E—4 to 7 inches; very pale brown (10YR 7/3) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to

weak fine granular; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; few fine and common very fine pores; neutral; abrupt smooth boundary.

Btn—7 to 20 inches; light yellowish brown (2.5Y 6/4) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky; hard, very firm, very sticky, moderately plastic; common very fine and fine roots; many very fine pores; many faint clay films on faces of peds and in pores; moderately alkaline; clear smooth boundary.

Bky—20 to 28 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; moderate medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, moderately plastic; few very fine roots; common fine nests and seams of gypsum crystals; many fine and medium masses of lime; strongly alkaline; clear smooth boundary.

BC—28 to 34 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; strongly alkaline; gradual smooth boundary.

C—34 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky, slightly plastic; strongly alkaline.

Range in Characteristics

Depth to the Bky horizon: 12 to 30 inches
Soil phases: Gullied
Other features: Some pedons have a Bkz horizon.
Taxonomic note: The Archin soil is a taxadjunct to the series. It classifies as Fine-loamy, mixed Typic Natriboralfs. Use and management is similar.

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Loam or fine sandy loam
Clay content: 10 to 25 percent
Reaction: pH 6.1 to 7.3

E horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 3, 4, or 5 moist
Chroma: 1 to 3
Texture: Loam or fine sandy loam
Clay content: 10 to 25 percent
Reaction: pH 6.1 to 7.3

Btn horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loam or clay loam
Clay content: 25 to 34 percent
Electrical conductivity: 0 to 4 mmhos/cm
Sodium adsorption ratio: 13 to 20
Reaction: pH 6.6 to 8.4

Bky horizon
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 1 to 4
Texture: Loam or clay loam
Clay content: 20 to 35 percent
Electrical conductivity: 4 to 8 mmhos/cm
Sodium adsorption ratio: 13 to 20
Calcium carbonate equivalent: 5 to 15 percent
Gypsum content: 1 to 5 percent
Reaction: pH 7.4 to 9.0

BC horizon
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 1 to 4
Texture: Loam or clay loam
Clay content: 20 to 35 percent
Electrical conductivity: 4 to 8 mmhos/cm
Sodium adsorption ratio: 13 to 20
Reaction: pH 7.4 to 9.0

C horizon
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 1 to 4
Texture: Loam or clay loam
Clay content: 20 to 30 percent
Electrical conductivity: 4 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 20
Reaction: pH greater than 8.4

75A—Archin-Absher complex, 0 to 2 percent slopes

Setting

Landform:
- Archin—Alluvial fans and stream terraces
- Absher—Alluvial fans and stream terraces

Position on landform:
- Archin—Microhighs
- Absher—Microlows

Slope:
- Archin—0 to 2 percent
- Absher—0 to 2 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Archin and similar soils: 50 percent
Absher and similar soils: 35 percent

Minor Components
Chinook and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Very deep, nonsaline soils: 0 to 3 percent
Soils that have darker colored surface layers: 0 to 2 percent
Busby and similar soils: 0 to 2 percent
Soils that have slopes more than 2 percent: 0 to 2 percent

Major Component Description

Archin
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.6 inches

Absher
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

75C—Archin-Absher complex, 2 to 8 percent slopes

Setting

Landform:
- Archin—Alluvial fans and stream terraces
- Absher—Alluvial fans and stream terraces

Position on landform:
- Archin—Microhighs
- Absher—Microlows

Slope:
- Archin—2 to 8 percent
- Absher—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Archin and similar soils: 50 percent
Absher and similar soils: 35 percent

Minor Components
Chinook and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Very deep, nonsaline soils: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 2 percent
Soils with darker colored surface layers: 0 to 2 percent

Major Component Description

Archin
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.6 inches

Absher
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

175A—Archin loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Archin and similar soils: 85 percent

Minor Components
Absher and similar soils: 0 to 3 percent
Chinook and similar soils: 0 to 3 percent
Soils that have slopes more than 2 percent: 0 to 3 percent
Very deep, nonsaline soils: 0 to 2 percent
Soils that have darker colored surface layers: 0 to 2 percent
Areas of slickspots: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

175C—Archin loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Archin and similar soils: 85 percent

Minor Components
Absher and similar soils: 0 to 3 percent
Chinook and similar soils: 0 to 3 percent
Parchin and similar soils: 0 to 3 percent
Very deep, nonsaline soils: 0 to 3 percent
Areas of slickspots: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

275D—Archin, gullied-Delpoint complex, 4 to 15 percent slopes

Setting

Landform:
- Archin—Sedimentary plains
- Delpoint—Hills

Position on landform:
- Archin—Footslopes and toeslopes
- Delpoint—Shoulders and summits

Slope:
- Archin—4 to 8 percent
- Delpoint—4 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Archin and similar soils: 45 percent
Delpoint and similar soils: 40 percent

Minor Components
Very deep nonsaline soils: 0 to 3 percent
Gerdrum and similar soils: 0 to 3 percent
Yawdim and similar soils: 0 to 3 percent
Soils that have slopes more than 15 percent: 0 to 2 percent
Soils that have slopes less than 4 percent: 0 to 2 percent
Very deep, silt loam soils: 0 to 2 percent

Major Component Description

Archin
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.6 inches

Delpoint
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

375C—Archin-Ynot complex, 2 to 8 percent slopes

Setting

Landform:
- Archin—Alluvial fans and stream terraces
- Ynot—Alluvial fans and stream terraces

Slope:
- Archin—2 to 8 percent
- Ynot—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Archin and similar soils: 45 percent
Ynot and similar soils: 40 percent

Minor Components
Absher and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 3 percent

Major Component Description

Archin
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 8.2 inches

Ynot
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Arsite Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Alluvium or semiconsolidated shale
Slope range: 0 to 25 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents

Typical Pedon

Arsite clay, 0 to 8 percent slopes, in an area of rangeland, 2,100 feet south and 550 feet east of the northwest corner of sec. 9, T. 2 S., R. 58 E.

A—0 to 2 inches; light brownish gray (10YR 6/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; strong fine subangular blocky structure with 1/2-inch thick vesicular crust on surface;

slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; neutral; clear wavy boundary.
Cyz1—2 to 6 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; strong coarse prismatic structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common fine masses and seams of gypsum crystals; few very fine seams of other salts; slightly acid; clear wavy boundary.
Cyz2—6 to 12 inches; light brownish gray (10YR 6/2) clay, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; 30 percent soft shale fragments; common medium masses of gypsum crystals; few fine and medium masses and seams of other salts; few thin horizontal iron stains and few small masses of sulfur; moderately acid; clear wavy boundary.
Cr—12 to 60 inches; grayish brown (10YR 5/2) semiconsolidated shale that crushes to clay, very dark grayish brown (10YR 3/2) moist.

Range in Characteristics

Soil temperature: 43 to 47 degrees F
Depth to the Cr horizon: 10 to 20 inches

A horizon
Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay when mixed to 7 inches
Clay content: 15 to 30 percent
Electrical conductivity: 8 to 16 mmhos/cm
Reaction: pH 6.1 to 7.8

Cyz1 horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 2 or 3
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Electrical conductivity: 8 to 16 mmhos/cm
Reaction: pH 5.6 to 7.3

Cyz2 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 3, 4, or 5 moist
Chroma: 2 or 3
Texture: Silty clay or clay
Clay content: 40 to 60 percent
Content of rock fragments: 30 to 50 percent soft shale fragments
Electrical conductivity: 8 to 16 mmhos/cm
Reaction: pH 5.6 to 7.8

79C—Arsite clay, 0 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 0 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Arsite and similar soils: 85 percent

Minor Components
Bascovy and similar soils: 0 to 4 percent
Neldore and similar soils: 0 to 4 percent
Vaeda and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: Mainly 1.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

179E—Arsite-Rock outcrop complex, 8 to 25 percent slopes

Setting

Landform:
- Arsite—Hills
- Rock outcrop—Hills

Position on landform:
- Arsite—Backslopes and footslopes
- Rock outcrop—Summits

Slope: 8 to 25 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Arsite and similar soils: 45 percent
Rock outcrop: 40 percent

Minor Components
Bascovy and similar soils: 0 to 5 percent
Neldore and similar soils: 0 to 5 percent
Very shallow clayey soils: 0 to 5 percent

Major Component Description

Arsite
Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: Mainly 1.0 inches

Rock outcrop
Definition: Consolidated shale

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Assinniboine Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans, stream terraces, sedimentary plains, and hills
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Assinniboine sandy clay loam, 2 to 8 percent slopes, in an area of rangeland, 2,050 feet south and 2,130 feet west of the northeast corner of sec. 21, T. 2 N., R. 57 E.

A—0 to 3 inches; grayish brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; loose, friable, nonsticky, nonplastic; few fine and medium and many very fine roots; neutral; clear smooth boundary.

Bt1—3 to 16 inches; grayish brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky, slightly plastic; many very fine roots; common distinct clay films on faces of peds and in pores; neutral; clear smooth boundary.

Bt2—16 to 23 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky, slightly plastic; common very fine, fine, and medium roots; many distinct clay films on faces of peds and in pores; slightly alkaline; clear smooth boundary.

Btk—23 to 32 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots; few very fine and fine pores; few faint clay films on faces of ped and in pores; few fine seams of lime; slightly effervescent; slightly alkaline; gradual smooth boundary.

Bk—32 to 42 inches; light gray (2.5Y 7/2) sandy loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots; common fine masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

BC—42 to 60 inches; light brownish gray (2.5Y 6/2) sandy loam, grayish brown (2.5Y 5/2) moist; massive; loose, friable, nonsticky, nonplastic; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Btk horizon: 10 to 25 inches
Other features: In areas that are cultivated, a sandy clay loam texture results from mixing the A and Bt horizons. Some pedons have a thin strata of loamy sand, loamy fine sand, or sand at depths below 40 inches.

A horizon
Hue: 10YR or 2.5Y
Chroma: 2 or 3
Texture: Fine sandy loam or sandy clay loam when mixed to 7 inches

Content of rock fragments: 0 to 15 percent pebbles
Clay content: 5 to 25 percent
Reaction: pH 6.1 to 7.8

Bt horizons
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 2 to 4
Texture: Sandy clay loam or fine sandy loam
Clay content: 18 to 30 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.6 to 7.8

Btk and Bk horizons
Hue: 2.5Y or 10YR
Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Sandy loam, fine sandy loam, or sandy clay loam
Clay content: 10 to 27 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

BC horizon
Hue: 2.5Y or 10YR
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Stratifications of fine sandy loam, sandy loam, loamy fine sand, and fine sand
Clay content: 10 to 27 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 7.4 to 8.4

74A—Assinniboine sandy clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Assinniboine and similar soils: 85 percent

Minor Components
Archin and similar soils: 0 to 4 percent
Eapa and similar soils: 0 to 4 percent
Chinook and similar soils: 0 to 4 percent
Marmarth and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Sandy clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

74C—Assinniboine sandy clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Assinniboine and similar soils: 85 percent

Minor Components
Archin and similar soils: 0 to 4 percent
Eapa and similar soils: 0 to 4 percent
Chinook and similar soils: 0 to 4 percent
Marmarth and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Sandy clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

174C—Assinniboine-Ynot complex, 2 to 8 percent slopes

Setting

Landform:
- Assinniboine—Alluvial fans and stream terraces
- Ynot—Alluvial fans and stream terraces

Slope:
- Assinniboine—2 to 8 percent
- Ynot—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Assinniboine and similar soils: 50 percent
Ynot and similar soils: 35 percent

Minor Components
Marmarth and similar soils: 0 to 4 percent
Twilight and similar soils: 0 to 4 percent
Soils that have slopes more than 8 percent: 0 to 4 percent
Soils with lighter colored surface layers: 0 to 2 percent
Areas of blowouts: 0 to 1 percent

Major Component Description

Assinniboine
Surface layer texture: Sandy clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches

Ynot
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

13F—Badland

Setting

Landform: Hills
Slope: 8 to 70 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Badland: 85 percent

Minor Components
Cabbart and similar soils: 0 to 3 percent
Neldore and similar soils: 0 to 3 percent
Yawdim and similar soils: 0 to 3 percent
Very shallow clayey soils: 0 to 2 percent
Very shallow loamy soils: 0 to 2 percent
Weingart and similar soils: 0 to 2 percent

Major Component Description

Definition: Badlands are barren or nearly barren of vegetation and have numerous deeply entrenched, intermittent drainageways. They were formed by active geologic erosion of soft, multicolored sedimentary beds that are mainly sandstone, siltstone, and shale.
Surface layer texture: Unweathered bedrock
Flooding: None

Bascovy Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated shale
Slope range: 0 to 21 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic, frigid Leptic Udic Haplusterts

Typical Pedon

Bascovy clay, in an area of Neldore-Bascovy clays, 4 to 15 percent slopes, in an area of rangeland, 1,500 feet north and 800 feet west of the southeast corner of sec. 22, T. 3 S., R. 58 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, moderately

sticky, moderately plastic; few fine and many very fine roots; few very fine pores; neutral; clear smooth boundary.

Bss—3 to 12 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm, very sticky, very plastic; few fine and many very fine roots; common very fine pores; common distinct slickensides; neutral; clear smooth boundary.

Bssy—12 to 19 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; weak medium and coarse subangular blocky structure; very hard, firm, very sticky, very plastic; few very fine roots; common very fine pores; common distinct slickensides; many very fine and fine masses and seams of gypsum crystals; disseminated lime; slightly effervescent; slightly alkaline; clear smooth boundary.

BC—19 to 26 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, moderately sticky, moderately plastic; few very fine roots; slightly alkaline; gradual smooth boundary.

C—26 to 34 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, moderately sticky, moderately plastic; slightly acid; abrupt smooth boundary.

Cr—34 to 60 inches; grayish brown (2.5Y 5/2) semiconsolidated shale that crushes to clay, dark grayish brown (2.5Y 4/2) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr horizon: 20 to 40 inches
Soil phases: Warm
Taxonomic note: Map units 623D, 633D, and 635C are taxadjuncts to the Bascovy series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 3, 4, or 5 moist
Chroma: 1 to 3
Clay content: 40 to 60 percent
Electrical conductivity: 2 to 4 mmhos/cm
Reaction: pH 6.6 to 8.4

Bss horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Electrical conductivity: 2 to 4 mmhos/cm
Reaction: pH 6.1 to 8.4

Bssy horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Gypsum content: 1 to 5 percent
Electrical conductivity: 2 to 4 mmhos/cm
Reaction: pH 6.1 to 8.4

BC and C horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 or 2
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Electrical conductivity: 2 to 8 mmhos/cm
Reaction: pH 5.1 to 8.4

90C—Bascovy clay, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bascovy and similar soils: 85 percent

Minor Components
Neldore and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 3 percent
Weingart and similar soils: 0 to 3 percent
Soils with silt loam surface layers: 0 to 3 percent
Soils with calcareous surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

90D—Bascovy clay, 8 to 15 percent slopes

Setting

Landform: Hills
Slope: 8 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bascovy and similar soils: 85 percent

Minor Components
Neldore and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 4 percent
Weingart and similar soils: 0 to 4 percent
Soils with silt loam surface layers: 0 to 2 percent
Soils with calcareous surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

490C—Bascovy-Ethridge complex, 2 to 8 percent slopes

Setting

Landform:
- Bascovy—Sedimentary plains
- Ethridge—Stream terraces

Slope:
- Bascovy—2 to 8 percent
- Ethridge—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bascovy and similar soils: 50 percent
Ethridge and similar soils: 35 percent

Minor Components
Neldore and similar soils: 0 to 4 percent
Eapa and similar soils: 0 to 4 percent
Weingart and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 3 percent
Abor and similar soils: 0 to 1 percent

Major Component Description

Bascovy
Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.3 inches

Ethridge
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

590C—Bascovy-Marvan complex, 2 to 8 percent slopes

Setting

Landform:
- Bascovy—Sedimentary plains
- Marvan—Sedimentary plains

Slope:
- Bascovy—2 to 8 percent
- Marvan—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bascovy and similar soils: 50 percent
Marvan and similar soils: 35 percent

Minor Components
Neldore and similar soils: 0 to 4 percent
Kobase and similar soils: 0 to 4 percent
Weingart and similar soils: 0 to 4 percent
Abor and similar soils: 0 to 3 percent

Major Component Description

Bascovy
Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.3 inches

Marvan
Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

623D—Bascovy clay, warm, 0 to 9 percent slopes

Setting

Landform: Sedimentary plains and hills
Slope: 0 to 9 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bascovy and similar soils: 85 percent

Minor Components
Neldore and similar soils: 0 to 4 percent
Soils with calcareous surface layers: 0 to 4 percent
Marvan and similar soils: 0 to 4 percent
Weingart and similar soils: 0 to 2 percent
Soils with silty clay loam surfaces: 0 to 1 percent

Major Component Description

Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

633D—Bascovy-Neldore clays, warm, 6 to 21 percent slopes

Setting

Landform:
- Bascovy—Sedimentary plains and hills
- Neldore—Sedimentary plains and hills

Position on landform:
- Bascovy—Backslopes and shoulders
- Neldore—Shoulders and summits

Slope:
- Bascovy—6 to 21 percent
- Neldore—6 to 21 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bascovy and similar soils: 50 percent
Neldore and similar soils: 35 percent

Minor Components
Abor and similar soils: 0 to 4 percent
Weingart and similar soils: 0 to 4 percent

Volborg and similar soils: 0 to 4 percent
Vaeda and similar soils: 0 to 3 percent

Major Component Description

Bascovy
Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.3 inches

Neldore
Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Beaverflat Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour) over rapid (6.0 to 20.0 inches/hour)
Landform: Relict stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal mixed Aridic Argiborolls

Typical Pedon

Beaverflat loam, 0 to 4 percent slopes, in an area of cropland, 1,300 feet south and 50 feet west of the northeast corner of sec. 27, T. 2 N., R. 56 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak thick platy structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; few very fine and fine pores; slightly acid; clear smooth boundary.

Bt1—7 to 15 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine tubular pores; common faint clay films on faces of peds and in pores; slightly acid; clear wavy boundary.

Bt2—15 to 30 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; strong fine and medium subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; few fine and common very fine roots; common very fine and fine tubular pores; common faint clay films on faces of peds and in pores; neutral; gradual wavy boundary.

BC—30 to 34 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; very hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine pores; neutral; abrupt wavy boundary.

2C—34 to 60 inches; variegated colored sand; single grain; loose, nonsticky, nonplastic; 10 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 10 to 16 inches
Depth to the 2C horizon: 20 to 40 inches

Ap horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Texture: Loam or sandy loam
Clay content: 10 to 27 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 5.6 to 6.5

Bt horizons
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3 or 4 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or sandy clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.1 to 7.3

BC horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 3 or 4
Texture: Loam or sandy clay loam
Clay content: 15 to 27 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.6 to 7.3

2C horizon
Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 5 or 6 moist
Chroma: 3 or 4
Texture: Sand or loamy sand
Clay content: 0 to 5 percent
Content of rock fragments: 0 to 35 percent pebbles
Reaction: pH 6.6 to 7.3

30A—Beaverflat loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces
Slope: 0 to 4 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Beaverflat and similar soils: 85 percent

Minor Components
Varney and similar soils: 0 to 4 percent
Eapa and similar soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 4 percent
Soils with lighter colored surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

130A—Beaverflat sandy loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces
Slope: 0 to 4 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Beaverflat and similar soils: 85 percent

Minor Components
Varney and similar soils: 0 to 4 percent
Eapa and similar soils: 0 to 4 percent
Soils with calcareous surface layers: 0 to 4 percent
Soils with darker colored surface layers: 0 to 2 percent
Soils with lighter colored surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Beenom Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Bedrock-floored plains
Parent material: Sandstone and quartzite residuum
Slope range: 1 to 8 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Loamy, mixed Lithic Argiborolls

Typical Pedon

Beenom loam, in an area of Beenom-Parchin complex, 2 to 8 percent slopes, in an area of rangeland, 1,200 feet north and 500 feet west of the southeast corner of sec. 10, T. 1 S., R. 61 E.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine roots; neutral; clear smooth boundary.

Bt1—4 to 10 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; many faint clay films on faces of peds, continuous distinct clay films in pores; slightly alkaline; clear smooth boundary.

Bt2—10 to 16 inches; pale brown (10YR 6/3) gravelly sandy clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, friable, slightly sticky, plastic; common very fine and fine roots; few very fine pores; many faint clay films on faces of peds and sandstone fragments, many distinct clay films in pores; 30 percent sandstone fragments; slightly alkaline; abrupt smooth boundary.

R—16 to 60 inches; hard platy sandstone.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Thickness of the mollic epipedon: 8 to 13 inches
Depth to bedrock: 10 to 20 inches
Other features: Some pedons have a Btk horizon.
Taxonomic note: Map unit 49A is a taxadjunct to the Beenom series because of fragmental material to 30 inches.

A horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 3, 4, or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 10 to 27 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.6 to 7.8

Bt1 horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 3, 4, or 5 dry; 2, 3, or 4 moist
Chroma: 2 or 3
Texture: Clay loam, fine sandy loam, or sandy clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 0 to 30 percent pebbles
Reaction: pH 7.4 to 8.4

Bt2 horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 4 to 6 dry; 3 or 4 moist
Chroma: 2 or 3
Texture: Clay loam, fine sandy loam, or sandy clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 0 to 30 percent pebbles
Reaction: pH 7.4 to 8.4

49A—Beenom-Reeder loams, 1 to 4 percent slopes

Setting

Landform:
- Beenom—Bedrock-floored plains
- Reeder—Sedimentary plains

Slope:
- Beenom—1 to 4 percent
- Reeder—1 to 4 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Beenom and similar soils: 60 percent
Reeder and similar soils: 25 percent

Minor Components
Very deep loamy soils: 0 to 5 percent
Soils with slopes more than 4 percent: 0 to 5 percent
Deep soils over hard sandstone: 0 to 5 percent

Major Component Description

Beenom
Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Quartzite residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Reeder
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

116C—Beenom-Parchin complex, 2 to 8 percent slopes

Setting

Landform:
- Beenom—Bedrock-floored plains
- Parchin—Sedimentary plains

Slope:
- Beenom—2 to 8 percent
- Parchin—2 to 8 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Beenom and similar soils: 50 percent
Parchin and similar soils: 35 percent

Minor Components
Areas of rock outcrop: 0 to 4 percent
Very shallow soils: 0 to 4 percent
Moderately deep loamy soils: 0 to 3 percent
Very deep sandy loam soils: 0 to 2 percent
Soils with flaggy sandy loam surfaces: 0 to 2 percent

Major Component Description

Beenom
Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches

Parchin
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Belltower Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated, loamy sedimentary beds
Slope range: 4 to 60 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Fine-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Belltower loam, in an area of Belltower-Dast complex, 35 to 60 percent slopes, in an area of forestland, 1,300 feet north and 2,600 feet east of the southwest corner of sec. 24, T. 1 N., R. 57 E.

Oi—2 inches to 0; partially decomposed forest litter.
A—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 2/2) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; common medium and coarse and many very fine and fine roots; common fine and many very fine tubular pores; slightly acid; clear smooth boundary.
E—8 to 17 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, medium, and coarse roots; many very fine and fine tubular pores; 5 percent soft channers; neutral; clear wavy boundary.
Bt—17 to 32 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to

strong medium subangular blocky; very hard, firm, moderately sticky, moderately plastic; few fine and medium and common very fine roots; common fine and many very fine tubular pores; 20 percent soft channers; common faint clay films on faces of peds, common distinct clay films in pores; neutral; clear wavy boundary.

Bk—32 to 36 inches; light gray (2.5Y 7/2) loam, light brownish gray (2.5Y 6/2) moist; moderate medium prismatic structure; soft, very friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine tubular pores; 50 percent soft channers and flagstones; few fine and medium masses and seams of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—36 to 60 inches; light gray (5Y 7/2) semiconsolidated loamy sedimentary beds that crush to a loam, olive gray (5Y 5/2) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bt horizon: 10 to 18 inches
Depth to the Bk horizon: 19 to 35 inches
Depth to the Cr horizon: 20 to 40 inches

A horizon
Value: 3, 4, or 5 dry; 2 or 3 moist
Chroma: 1 or 2
Clay content: 12 to 20 percent
Content of rock fragments: 0 to 30 percent—0 to 5 percent hard flagstones; 0 to 5 percent hard channers; 0 to 20 percent soft flagstones and channers
Reaction: pH 6.1 to 7.3

E horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam, sandy loam, or fine sandy loam
Clay content: 12 to 18 percent
Content of rock fragments: 0 to 30 percent—0 to 5 percent hard flagstones; 0 to 5 percent hard channers; 0 to 20 percent soft flagstones and channers
Reaction: pH 6.1 to 7.3

Bt horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loam, sandy clay loam, or clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 10 to 60 percent—0 to 5 percent hard flagstones; 0 to 5 percent hard channers; 10 to 50 percent soft flagstones and channers
Reaction: pH 6.1 to 7.3

Bk horizon
Hue: 2.5Y or 5Y
Value: 5, 6, or 7 dry
Chroma: 2 to 4
Texture: Loam, clay loam, sandy clay loam, or fine sandy loam
Clay content: 15 to 30 percent
Content of rock fragments: 20 to 80 percent—0 to 5 percent hard flagstones; 0 to 5 percent hard channers; 20 to 70 percent soft flagstones and channers
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

144D—Belltower-Reeder-Vebar complex, 4 to 15 percent slopes

Setting

Landform:
- Belltower—Sedimentary plains and hills
- Reeder—Sedimentary plains and hills
- Vebar—Sedimentary plains and hills

Slope:
- Belltower—4 to 15 percent
- Reeder—4 to 15 percent
- Vebar—4 to 15 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Belltower and similar soils: 30 percent
Reeder and similar soils: 30 percent
Vebar and similar soils: 25 percent

Minor Components
Very shallow loamy soils: 0 to 4 percent
Shallow loamy soils: 0 to 4 percent
Very deep sandy soils: 0 to 3 percent
Soils with flaggy and channery surfaces: 0 to 2 percent
Soils with flagstones: 0 to 2 percent

Major Component Description

Belltower
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.1 inches

Reeder
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.2 inches

Vebar
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

144E—Belltower-Dast-Reeder complex, 15 to 35 percent slopes

Setting

Landform:
- Belltower—Hills
- Dast—Hills
- Reeder—Hills

Slope:
- Belltower—15 to 35 percent
- Dast—15 to 35 percent
- Reeder—15 to 35 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Belltower and similar soils: 30 percent
Dast and similar soils: 30 percent
Reeder and similar soils: 25 percent

Minor Components
Shallow sandy soils: 0 to 4 percent
Shallow loamy soils: 0 to 4 percent
Areas of rock outcrop: 0 to 4 percent
Very deep sandy soils: 0 to 3 percent

Major Component Description

Belltower
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.1 inches

Dast
Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.6 inches

Reeder
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

144F—Belltower-Dast complex, 35 to 60 percent slopes

Setting

Landform:
- Belltower—Hills
- Dast—Hills

Slope:
- Belltower—35 to 60 percent
- Dast—35 to 60 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Belltower and similar soils: 45 percent
Dast and similar soils: 40 percent

Minor Components
Shallow sandy soils: 0 to 4 percent
Shallow loamy soils: 0 to 4 percent
Soils that have slopes less than 35 percent: 0 to 4 percent
Moderately deep loamy soils: 0 to 3 percent

Major Component Description

Belltower
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.1 inches

Dast
Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bickerdyke Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic, frigid Sodic Haplusterts

Typical Pedon

Bickerdyke clay, 0 to 2 percent slopes, in an area of rangeland, 2,200 feet north and 1,800 feet west of the southeast corner of sec. 27, T. 5 S., R. 61 E.

E—0 to 1 inch; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; massive crust; hard, friable, very sticky, very plastic; many very fine roots; many very fine pores; moderately alkaline; abrupt smooth boundary.

Bss—1 to 8 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky, very plastic; many very fine roots; few fine and many very fine pores; few faint slickensides; moderately alkaline; clear smooth boundary.

Bssy—8 to 14 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky, very plastic; few very fine roots; common very fine pores; common intersecting slickensides; common fine nests and seams of gypsum crystals; moderately alkaline; clear smooth boundary.

Bssyz—14 to 22 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky, very plastic; few very fine roots; common very fine pores; common intersecting slickensides; common fine nests and seams of gypsum crystals; few fine seams and nests of other salts; strongly alkaline; gradual smooth boundary.

Byz—22 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky, very plastic; few very fine roots; common very fine pores; common fine nests and seams of gypsum crystals; few fine seams and nests of other salts; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F
Depth to the Bssy horizon: 6 to 15 inches
Other features: This soil has 1/2- to 1-inch cracks that extend to 20 inches or more and have few to many slickensides. The 1 chromas are lithochromic.

E horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 1 or 2
Clay content: 40 to 60 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

Bss horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 or 2
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.9 to 8.4

Bssy horizon
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 1 or 2
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Electrical conductivity: 4 to 8 mmhos/cm
Sodium adsorption ratio: 10 to 15
Gypsum content: 5 to 15 percent
Reaction: pH 7.9 to 9.0

Bssyz horizon
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 1 or 2
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 15 to 30
Gypsum content: 5 to 15 percent
Reaction: pH 7.9 to 9.0

Byz horizon
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 1 or 2
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 15 to 30
Reaction: pH 7.9 to 9.4

87A—Bickerdyke clay, 0 to 2 percent slopes

Setting

Landform: Sedimentary plains
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bickerdyke and similar soils: 85 percent

Minor Components
Gerdrum and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 4 percent
Weingart and similar soils: 0 to 3 percent
Bascovy and similar soils: 0 to 2 percent
Soils with silty clay loam surfaces: 0 to 2 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

87C—Bickerdyke clay, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bickerdyke and similar soils: 85 percent

Minor Components
Gerdrum and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 4 percent

Weingart and similar soils: 0 to 3 percent
Bascovy and similar soils: 0 to 2 percent
Soils with silty clay loam surfaces: 0 to 2 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Blacksheep Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills and sedimentary plains
Parent material: Semiconsolidated, sandy sedimentary beds
Slope range: 4 to 50 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents

Typical Pedon

Blacksheep fine sandy loam, in an area of Blacksheep-Twilight fine sandy loams, 8 to 15 percent slopes, in an area of rangeland, 2,100 feet south and 1,800 feet west of the northeast corner of sec. 33, T. 6 S., R. 55 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; few very fine and fine pores; slightly effervescent; slightly alkaline; clear wavy boundary.

Bk—4 to 16 inches; light olive brown (2.5Y 5/4) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; few very fine pores; few fine masses of lime; slightly effervescent; moderately alkaline; gradual smooth boundary.

Cr—16 to 60 inches; light yellowish brown (2.5Y 6/4) semiconsolidated sandy sedimentary beds that crush to loamy sand, grayish brown (2.5Y 5/2) moist.

Range in Characteristics

Soil temperature: 44 to 47 degrees F
Depth to the Cr horizon: 10 to 20 inches

A horizon
Hue: 2.5Y, 10YR, or 7.5YR
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 5 to 15 percent
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 2.5Y, 10YR, or 7.5YR
Value: 5, 6, or 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Very fine sandy loam, fine sandy loam, sandy loam, or loamy fine sand
Clay content: 5 to 15 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 8.4

55D—Blacksheep-Twilight fine sandy loams, 8 to 15 percent slopes

Setting

Landform:
- Blacksheep—Hills
- Twilight—Hills

Position on landform:
- Blacksheep—Shoulders and summits
- Twilight—Backslopes and footslopes

Slope:
- Blacksheep—8 to 15 percent
- Twilight—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Blacksheep and similar soils: 45 percent
Twilight and similar soils: 45 percent

Minor Components
Cabbart and similar soils: 0 to 2 percent
Busby and similar soils: 0 to 2 percent

Very shallow loamy soils: 0 to 2 percent
Shallow silt loam soils: 0 to 2 percent
Soils that have slopes more than 15 percent: 0 to 1 percent
Areas of blowouts: 0 to 1 percent

Major Component Description

Blacksheep
Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Twilight
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

55E—Blacksheep-Twilight fine sandy loams, 15 to 45 percent slopes

Setting

Landform:
- Blacksheep—Hills
- Twilight—Hills

Position on landform:
- Blacksheep—Shoulders and summits
- Twilight—Backslopes and footslopes

Slope:
- Blacksheep—15 to 45 percent
- Twilight—15 to 45 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Blacksheep and similar soils: 50 percent
Twilight and similar soils: 40 percent

Minor Components
Cabbart and similar soils: 0 to 2 percent
Shallow silt loam soils: 0 to 2 percent
Areas of blowouts: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Very shallow loamy soils: 0 to 1 percent
Soils that have slopes less than 15 percent: 0 to 1 percent

Major Component Description

Blacksheep
Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Twilight
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

155E—Blacksheep-Rock outcrop complex, 25 to 50 percent slopes

Setting

Landform:
- Blacksheep—Hills
- Rock outcrop—Hills

Position on landform:
- Blacksheep—Backslopes
- Rock outcrop—Shoulders and summits

Slope: 25 to 50 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Blacksheep and similar soils: 60 percent
Rock outcrop: 30 percent

Minor Components
Cabbart and similar soils: 0 to 2 percent
Areas of blowouts: 0 to 2 percent
Soils that have slopes more than 50 percent: 0 to 2 percent
Soils that have slopes less than 25 percent: 0 to 2 percent
Delpoint and similar soils: 0 to 2 percent

Major Component Description

Blacksheep
Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

Rock outcrop
Definition: Consolidated sandstone

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bonfri Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Interbedded sandstone and shale
Slope range: 2 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed Typic Eutroboralfs

Typical Pedon

Bonfri loam, 8 to 15 percent slopes, in an area of rangeland, 500 feet north and 2,400 feet west of the southeast corner of sec. 22, T. 3 N., R. 57 E.

A—0 to 4 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure parting to weak fine granular; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine pores; neutral; clear smooth boundary.

Bt—4 to 18 inches; light olive brown (2.5Y 5/4) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, moderately plastic; many very fine and fine roots; few fine and common very fine pores; many faint clay films on faces of peds, many distinct clay films in pores; neutral; gradual wavy boundary.

Bk—18 to 30 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common very fine roots; few very fine pores; common fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—30 to 60 inches; light gray (2.5Y 7/2) interbedded sandstone and shale that crush to sandy loam, light brownish gray (2.5Y 6/2) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 13 to 30 inches
Depth to the Cr horizon: 20 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 18 to 27 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 7.8

Bt horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay loam, silty clay loam, or sandy clay loam
Clay content: 27 to 35 percent
Sand content: Greater than 15 percent fine sand or coarser

Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 7.8

Bk horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 or 3
Texture: Clay loam, loam, or sandy clay loam
Clay content: 20 to 32 percent
Content of rock fragments: 0 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

91C—Bonfri loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bonfri and similar soils: 85 percent

Minor Components
Weingart and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Twilight and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Soils with darker colored surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

91D—Bonfri loam, 8 to 15 percent slopes

Setting

Landform: Hills
Slope: 8 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bonfri and similar soils: 85 percent

Minor Components
Weingart and similar soils: 0 to 3 percent
Twilight and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Soils with darker colored surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

191C—Bonfri-Cambeth complex, 2 to 8 percent slopes

Setting

Landform:
• Bonfri—Sedimentary plains
• Cambeth—Sedimentary plains
Slope:
• Bonfri—2 to 8 percent
• Cambeth—2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bonfri and similar soils: 50 percent
Cambeth and similar soils: 35 percent

Minor Components
Cabbart and similar soils: 0 to 4 percent
Twilight and similar soils: 0 to 4 percent
Busby and similar soils: 0 to 3 percent
Weingart and similar soils: 0 to 2 percent
Soils with darker colored surface layers: 0 to 1 percent
Soils that have slopes more than 8 percent: 0 to 1 percent

Major Component Description

Bonfri
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.1 inches

Cambeth
Surface layer texture: Silt loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

291D—Bonfri-Cabbart loams, 8 to 15 percent slopes

Setting

Landform:
- Bonfri—Hills
- Cabbart—Hills

Position on landform:
- Bonfri—Backslopes and shoulders
- Cabbart—Shoulders and summits

Slope:
- Bonfri—8 to 15 percent
- Cabbart—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bonfri and similar soils: 50 percent
Cabbart and similar soils: 35 percent

Minor Components
Very shallow loamy soils: 0 to 3 percent
Deep loamy soils: 0 to 3 percent
Weingart and similar soils: 0 to 3 percent
Twilight and similar soils: 0 to 3 percent
Soils with darker colored surface layers: 0 to 3 percent

Major Component Description

Bonfri
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.1 inches

Cabbart
Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

391C—Bonfri-Parchin complex, 2 to 8 percent slopes

Setting

Landform:
- Bonfri—Sedimentary plains
- Parchin—Sedimentary plains

Slope:
- Bonfri—2 to 8 percent
- Parchin—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Bonfri and similar soils: 45 percent
Parchin and similar soils: 40 percent

Minor Components
Archin and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Weingart and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 2 percent
Cabbart and similar soils: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 2 percent

Major Component Description

Bonfri
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.1 inches

Parchin
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Broadus Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Hills
Parent material: Colluvium
Slope range: 8 to 65 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Fine-loamy, mixed, frigid Typic Ustochrepts

Typical Pedon

Broadus loam, in an area of Broadus-Ridge-Reeder complex, 8 to 25 percent slopes, in an area of forestland, 1,500 feet north and 300 feet east of the southwest corner of sec. 5, T. 8 S., R. 55 E.

Oi—1 inch to 0; slightly decomposed forest litter.
A—0 to 4 inches; light yellowish brown (10YR 6/4) loam, grayish brown (10YR 5/2) moist; weak fine granular structure; soft, friable, slightly sticky, slightly plastic; many fine roots; many fine tubular pores; neutral; clear smooth boundary.
Bw—4 to 12 inches; pale brown (10YR 6/3) loam, grayish brown (10YR 5/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; few fine and many very fine tubular pores; slightly effervescent; slightly alkaline; clear smooth boundary.
Bk1—12 to 18 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; few fine and many very fine roots; many fine tubular pores; many fine masses of lime; violently effervescent; slightly alkaline; gradual smooth boundary.
Bk2—18 to 34 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; slightly hard, friable, moderately sticky, moderately plastic; common fine and medium roots; many fine tubular pores; many medium and coarse masses

of lime; violently effervescent; moderately alkaline; gradual smooth boundary.
Bk3—34 to 60 inches; light gray (2.5Y 7/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; slightly hard, friable, moderately sticky, moderately plastic; many medium roots; many fine tubular pores; many medium and coarse masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Depth to the Bk horizon: 11 to 15 inches

A horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 2 to 4
Clay content: 18 to 27 percent
Reaction: pH 6.6 to 7.8

Bw horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam, clay loam, or silty clay loam
Clay content: 18 to 35 percent
Sand content: 15 to 35 percent fine and medium sand
Reaction: pH 7.4 to 7.8

Bk1 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 6 dry; 5 or 6 moist
Chroma: 2 or 3
Texture: Loam, clay loam, or silty clay loam
Clay content: 18 to 35 percent
Sand content: 15 to 35 percent fine and medium sand
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 6 or 7 dry; 4, 5, or 6 moist
Chroma: 2 or 3
Texture: Loam, silt loam, clay loam, or silty clay loam
Clay content: 18 to 35 percent
Sand content: 15 to 35 percent fine and medium sand
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

126D—Broadus-Ridge-Reeder complex, 8 to 25 percent slopes

Setting

Landform:
- Broadus—Hills
- Ridge—Hills
- Reeder—Hills

Position on landform:
- Broadus—Backslopes
- Ridge—Shoulders and summits
- Reeder—Footslopes

Slope:
- Broadus—8 to 25 percent
- Ridge—8 to 25 percent
- Reeder—8 to 25 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Broadus and similar soils: 40 percent
Ridge and similar soils: 30 percent
Reeder and similar soils: 20 percent

Minor Components
Cabba and similar soils: 0 to 3 percent
Dast and similar soils: 0 to 3 percent
Twilight and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Broadus
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 10.2 inches

Ridge
Surface layer texture: Sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.2 inches

Reeder
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

126F—Broadus-Ridge-Rock outcrop complex, 25 to 65 percent slopes

Setting

Landform:
- Broadus—Hills
- Ridge—Hills
- Rock outcrop—Hills

Position on landform:
- Broadus—Backslopes
- Ridge—Shoulders and summits
- Rock outcrop—Summits

Slope:
- Broadus—25 to 65 percent
- Ridge—25 to 65 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Broadus and similar soils: 30 percent
Ridge and similar soils: 30 percent
Rock outcrop: 30 percent

Minor Components
Cabba and similar soils: 0 to 4 percent
Dast and similar soils: 0 to 3 percent
Moderately deep loamy soils: 0 to 3 percent

Major Component Description

Broadus
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 10.2 inches

Ridge
Surface layer texture: Sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.2 inches

Rock outcrop
Definition: Consolidated sandstone

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bullock Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains
Parent material: Semiconsolidated, loamy sedimentary beds
Slope range: 2 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed Borollic Natrargids

Typical Pedon

Bullock clay loam, in an area of Parchin-Bullock complex, 2 to 8 percent slopes, in an area of rangeland, 2,000 feet south and 1,000 feet east of the northwest corner of sec. 34, T. 2 N., R. 55 E.

E—0 to 2 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; many very fine roots; few very fine and fine pores; slightly alkaline; abrupt smooth boundary.

Btn1—2 to 6 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium columnar structure parting to moderate medium

subangular blocky; hard, firm, moderately sticky, very plastic; many very fine and fine roots; few very fine pores; few faint clay films on faces of peds and in pores; moderately alkaline; gradual smooth boundary.

Btn2—6 to 12 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, moderately sticky, very plastic; few fine and common very fine roots; few very fine pores; few faint clay films on faces of peds and in pores; strongly alkaline; clear smooth boundary.

Bkz—12 to 25 inches; light yellowish brown (2.5Y 6/4) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few very fine and fine roots; few very fine pores; few fine nests of salt crystals; disseminated lime; few fine threads of lime; violently effervescent; strongly alkaline; clear wavy boundary.

Bky—25 to 35 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, moderately sticky, moderately plastic; few very fine and fine roots; few very fine pores; few fine soft masses of gypsum; common medium masses of lime and few fine seams of lime; violently effervescent; strongly alkaline; gradual wavy boundary.

Cr—35 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated, loamy sedimentary beds that crush to silty clay loam, grayish brown (2.5Y 5/2) moist.

Range in Characteristics

Depth to the Bkz horizon: 10 to 15 inches
Depth to the Cr horizon: 20 to 40 inches
Other features: A clay loam texture results from mixing the E and Btn horizons in areas that are cultivated.
Taxonomic note: Bullock soil is a taxadjunct to the series. It classifies as Fine-loamy, mixed Typic Natriboralfs. Use and management are similar.

E horizon
Hue: 10YR or 2.5Y
Value: 5 to 7 dry; 3 or 4 moist
Chroma: 1 or 2
Texture: Clay loam when mixed to 7 inches
Clay content: 5 to 10 percent
Reaction: pH 7.4 to 7.8

Btn horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay loam or sandy clay loam
Clay content: 27 to 35 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 13 to 30
Reaction: pH 7.8 to 9.6

Bkz and Bky horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 1 to 4
Texture: Clay loam, sandy clay loam, or loam
Clay content: 25 to 32 percent
Electrical conductivity: 4 to 16 mmhos/cm
Sodium adsorption ratio: 20 to 40
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.8 to 9.6

Busby Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Alluvium
Slope range: 2 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Coarse-loamy, mixed, frigid Aridic Ustochrepts

Typical Pedon

Busby fine sandy loam, in an area of Busby-Blacksheep-Twilight fine sandy loams, 8 to 25 percent slopes, in an area of rangeland, 2,200 feet south and 2,000 feet west of the northeast corner of sec. 32, T. 2 S., R. 56 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; slightly alkaline; clear smooth boundary.

Bw—4 to 12 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; few very fine pores; slightly alkaline; clear wavy boundary.

Bk1—12 to 23 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; few

very fine pores; few very fine masses, seams, and threads of lime; strongly effervescent; moderately alkaline; clear wavy boundary.
Bk2—23 to 46 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine pores; few very fine and medium masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.
C—46 to 60 inches; light brownish gray (2.5Y 6/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; massive; loose, nonsticky, nonplastic; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
*Depth to the Bk horiz*on: 10 to 16 inches
Soil phases: Gullied

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 2 to 4
Clay content: 10 to 18 percent
Reaction: pH 7.4 to 8.4

Bw horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Fine sandy loam, sandy loam, or loam
Clay content: 10 to 18 percent
Reaction: pH 7.4 to 8.4

Bk horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Fine sandy loam or sandy loam
Clay content: 10 to 18 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

C horizon
Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 5 or 6 moist
Chroma: 2 to 4
Texture: Fine sandy loam, sandy loam, loamy fine sand, loamy sand, or fine sand (The loamy fine sand, loamy sand, or fine sand textures are below depths of 40 inches.)
Clay content: 3 to 18 percent
Reaction: pH 7.9 to 8.4

70C—Busby fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Busby and similar soils: 85 percent

Minor Components
Blacksheep and similar soils: 0 to 3 percent
Chinook and similar soils: 0 to 3 percent
Twilight and similar soils: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Soils that have slopes less than 2 percent: 0 to 2 percent
Soils with darker colored surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

70D—Busby fine sandy loam, 8 to 15 percent slopes

Setting

Landform: Hills
Slope: 8 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Busby and similar soils: 85 percent

Minor Components
Blacksheep and similar soils: 0 to 3 percent
Chinook and similar soils: 0 to 3 percent
Twilight and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 2 percent
Soils with darker colored surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

170D—Busby-Blacksheep-Twilight fine sandy loams, 8 to 25 percent slopes

Setting

Landform:
- Busby—Hills
- Blacksheep—Hills
- Twilight—Hills

Position on landform:
- Busby—Backslopes and footslopes
- Blacksheep—Shoulders and summits
- Twilight—Backslopes and footslopes

Slope:
- Busby—8 to 15 percent
- Blacksheep—8 to 25 percent
- Twilight—8 to 25 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Busby and similar soils: 40 percent
Blacksheep and similar soils: 30 percent
Twilight and similar soils: 15 percent

Minor Components
Cabbart and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Very shallow loamy soils: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent
Areas of blowouts: 0 to 2 percent
Soils with darker colored surface layers: 0 to 2 percent

Major Component Description

Busby
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.5 inches

Blacksheep
Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Twilight
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

170E—Busby-Blacksheep-Rock outcrop complex, 8 to 25 percent slopes

Setting

Landform:
- Busby—Hills
- Blacksheep—Hills
- Rock outcrop—Hills

Position on landform:
- Busby—Footslopes and toeslopes
- Blacksheep—Shoulders and summits
- Rock outcrop—Summits

Slope:
- Busby—8 to 15 percent
- Blacksheep—8 to 25 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Busby and similar soils: 40 percent
Blacksheep and similar soils: 30 percent
Rock outcrop: 20 percent

Minor Components
Cabbart and similar soils: 0 to 2 percent
Twilight and similar soils: 0 to 2 percent
Chinook and similar soils: 0 to 2 percent
Areas of blowouts: 0 to 2 percent
Yamacall and similar soils: 0 to 1 percent
Delpoint and similar soils: 0 to 1 percent

Major Component Description

Busby
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.5 inches

Blacksheep
Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Rock outcrop
Definition: Consolidated sandstone

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

270E—Busby, gullied-Delpoint-Yawdim complex, 8 to 25 percent slopes

Setting

Landform:
- Busby—Hills
- Delpoint—Hills
- Yawdim—Hills

Position on landform:
- Busby—Backslopes and footslopes
- Delpoint—Backslopes
- Yawdim—Shoulders and summits

Slope:
- Busby—8 to 15 percent
- Delpoint—8 to 25 percent
- Yawdim—8 to 25 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Busby and similar soils: 35 percent
Delpoint and similar soils: 30 percent
Yawdim and similar soils: 20 percent

Minor Components
Archin and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 3 percent
Areas of rock outcrop: 0 to 3 percent
Weingart and similar soils: 0 to 3 percent
Yamacall and similar soils: 0 to 2 percent
Poorly drained soils: 0 to 1 percent

Major Component Description

Busby
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.5 inches

Delpoint
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

Yawdim
Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Cabba Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated, loamy sedimentary beds
Slope range: 4 to 60 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents

Typical Pedon

Cabba loam, in an area of Reeder-Cabba loams, 4 to 15 percent slopes, in an area of rangeland, 2,000 feet north and 1,600 feet east of the southwest corner of sec. 4, T. 2 S., R. 61 E.

A—0 to 3 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine and many very fine roots; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.
Bk—3 to 7 inches; pale brown (10YR 6/3) loam, light olive brown (2.5Y 5/4) moist; weak thick platy structure; soft, friable, slightly sticky, slightly plastic; few fine and common very fine roots; few very fine pores; few fine and medium masses of lime; violently effervescent; slightly alkaline; clear wavy boundary.
C—7 to 16 inches; pale yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, slightly sticky, slightly plastic; few fine and common very fine roots; few very fine pores; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.
Cr—16 to 60 inches; pale yellow (2.5Y 7/4) semiconsolidated loamy sedimentary beds that crush to loam, light yellowish brown (2.5Y 6/4) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr horizon: 10 to 20 inches
Soil phases: Stony; the hard rock fragments in the stony and gravelly phases are mainly surficial deposits.

A horizon
Hue: 10YR or 2.5Y
Value: 3, 4, 5, or 6 dry; 3 or 4 moist
Chroma: 1 to 4
Texture: Loam or silt loam
Clay content: 10 to 27 percent
Content of rock fragments: 0 to 60 percent—0 to 40 percent boulders, stones, or cobbles; 0 to 30 percent pebbles or channers
Content of rock fragments, surface cover: 0 to 0.1 percent stones
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.4 to 9.0

Bk and C horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist
Chroma: 1 to 4 or 6
Texture: Loam, silt loam, clay loam, or silty clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles or channers
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 0 to 8 mmhos/cm
Reaction: pH 7.4 to 9.0

112D—Cabba silt loam, 8 to 15 percent slopes

Setting

Landform: Hills
Slope: 8 to 15 percent
Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Cabba and similar soils: 85 percent

Minor Components
Very shallow loamy soils: 0 to 4 percent
Dast and similar soils: 0 to 4 percent
Moderately deep loamy soils: 0 to 4 percent
Areas of rock outcrop: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

212E—Cabba-Rock outcrop complex, 15 to 45 percent slopes

Setting

Landform:
- Cabba—Hills
- Rock outcrop—Hills

Position on landform:
- Cabba—Backslopes
- Rock outcrop—Summits

Slope: 15 to 45 percent
Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Cabba and similar soils: 50 percent
Rock outcrop: 35 percent

Minor Components
Dast and similar soils: 0 to 5 percent
Very shallow loamy soils: 0 to 5 percent
Moderately deep loamy soils: 0 to 5 percent

Major Component Description

Cabba
Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.7 inches

Rock outcrop
Definition: Consolidated sandstone and shale

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

312D—Cabba-Dast complex, 8 to 15 percent slopes

Setting

Landform:
- Cabba—Hills
- Dast—Hills

Position on landform:
- Cabba—Shoulders and summits
- Dast—Backslopes and footslopes

Slope:
- Cabba—8 to 15 percent
- Dast—8 to 15 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Cabba and similar soils: 50 percent
Dast and similar soils: 35 percent

Minor Components
Very shallow sandy soils: 0 to 5 percent
Moderately deep loamy soils: 0 to 5 percent
Very deep silt loam soils: 0 to 5 percent

Major Component Description

Cabba
Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.7 inches

Dast
Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Flooding: None
Available water capacity: Mainly 3.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Cabbart Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated, loamy sedimentary beds
Slope range: 2 to 70 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents

Typical Pedon

Cabbart loam, in an area of Cabbart-Rock outcrop-Delpoint complex, 15 to 50 percent slopes, in an area of rangeland, 2,100 feet south and 1,000 feet east of the northwest corner of sec. 15, T. 4 N., R. 57 E.

A—0 to 3 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; few very fine and fine pores; violently effervescent; moderately alkaline; clear smooth boundary.

Bk—3 to 12 inches; pale yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; few very fine pores; common fine and medium masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Cr—12 to 60 inches; pale yellow (2.5Y 7/4) semiconsolidated, loamy sedimentary beds that crush to silt loam, light yellowish brown (2.5Y 6/4) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr horizon: 10 to 20 inches

A horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 3, 4, or 5 moist
Chroma: 2 to 4
Texture: Loam or silt loam
Clay content: 18 to 27 percent
Electrical conductivity: 0 to 4 mmhos/cm
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 9.0

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam or silt loam
Clay content: 18 to 27 percent
Electrical conductivity: 0 to 4 mmhos/cm
Sodium adsorption ratio: 1 to 5
Calcium carbonate equivalent: 10 to 15 percent
Reaction: pH 7.4 to 9.0

60D—Cabbart silt loam, 4 to 15 percent slopes

Setting

Landform: Sedimentary plains and hills
Slope: 4 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Cabbart and similar soils: 85 percent

Minor Components
Blacksheep and similar soils: 0 to 4 percent
Delpoint and similar soils: 0 to 4 percent
Very shallow loamy soils: 0 to 4 percent
Areas of rock outcrop: 0 to 2 percent
Soils that have slopes more than 15 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

160E—Cabbart-Rock outcrop-Delpoint complex, 15 to 50 percent slopes

Setting

Landform:
- Cabbart—Hills
- Rock outcrop—Hills
- Delpoint—Hills

Position on landform:
- Cabbart—Backslopes and shoulders
- Rock outcrop—Summits
- Delpoint—Backslopes

Slope:
- Cabbart—15 to 50 percent
- Delpoint—15 to 25 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Cabbart and similar soils: 50 percent
Rock outcrop: 20 percent
Delpoint and similar soils: 15 percent

Minor Components
Weingart and similar soils: 0 to 5 percent
Very shallow loamy soils: 0 to 5 percent
Yamacall and similar soils: 0 to 4 percent
Poorly drained soils: 0 to 1 percent

Major Component Description

Cabbart
Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

Rock outcrop
Definition: Consolidated sedimentary beds

Delpoint
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

160F—Cabbart-Rock outcrop-Yawdim complex, 15 to 70 percent slopes

Setting

Landform:
- Cabbart—Hills
- Rock outcrop—Hills
- Yawdim—Hills

Position on landform:
- Cabbart—Backslopes and shoulders
- Rock outcrop—Summits
- Yawdim—Backslopes and footslopes

Slope:
- Cabbart—15 to 70 percent
- Yawdim—15 to 70 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Cabbart and similar soils: 35 percent
Rock outcrop: 25 percent
Yawdim and similar soils: 25 percent

Minor Components
Delpoint and similar soils: 0 to 4 percent
Very shallow loamy soils: 0 to 4 percent
Soils that have slopes less than 15 percent: 0 to 4 percent
Weingart and similar soils: 0 to 3 percent

Major Component Description

Cabbart
Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 2.2 inches

Rock outcrop
Definition: Consolidated sedimentary beds

Yawdim
Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

260D—Cabbart-Cambeth silt loams, 8 to 15 percent slopes

Setting

Landform:
- Cabbart—Hills
- Cambeth—Hills

Position on landform:
- Cabbart—Shoulders and summits
- Cambeth—Backslopes

Slope:
- Cabbart—8 to 15 percent
- Cambeth—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Cabbart and similar soils: 50 percent
Cambeth and similar soils: 35 percent

Minor Components
Delpoint and similar soils: 0 to 4 percent
Very shallow loamy soils: 0 to 4 percent
Yamacall and similar soils: 0 to 3 percent
Weingart and similar soils: 0 to 2 percent
Soils that have slopes less than 8 percent: 0 to 2 percent

Major Component Description

Cabbart
Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

Cambeth
Surface layer texture: Silt loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

360D—Cabbart-Bascovy complex, 4 to 15 percent slopes

Setting

Landform:
- Cabbart—Sedimentary plains and hills
- Bascovy—Sedimentary plains and hills

Position on landform:
- Cabbart—Shoulders and summits
- Bascovy—Backslopes and footslopes

Slope:
- Cabbart—4 to 15 percent
- Bascovy—4 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Cabbart and similar soils: 50 percent
Bascovy and similar soils: 35 percent

Minor Components
Delpoint and similar soils: 0 to 4 percent
Gerdrum and similar soils: 0 to 4 percent

Parchin and similar soils: 0 to 3 percent
Very shallow clayey soils: 0 to 2 percent
Neldore and similar soils: 0 to 2 percent

Major Component Description

Cabbart
Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

Bascovy
Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Cambeth Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated, loamy sedimentary beds
Slope range: 2 to 25 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-silty, mixed, frigid Aridic Ustochrepts

Typical Pedon

Cambeth silt loam, in an area of Yamacall-Cambeth complex, 2 to 8 percent slopes, in an area of rangeland, 250 feet north and 1,500 feet east of the southwest corner of sec. 33, T. 8 S., R. 61 E.

A—0 to 4 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; weak medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; few fine pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.
Bw—4 to 12 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; few very fine and fine roots; few very fine pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.
Bk—12 to 32 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine pores; many fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.
Cr—32 to 60 inches; white (2.5Y 8/2) semiconsolidated, loamy sedimentary beds that crush to silt loam, light gray (2.5Y 7/2) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 10 to 15 inches
Depth to the Cr horizon: 20 to 40 inches
Soil phases: Calcareous

A horizon
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3 or 4 moist
Chroma: 2 to 4
Clay content: 18 to 27 percent
Effervescence: None to violently
Calcium carbonate equivalent: 0 to 10 percent
Reaction: pH 7.4 to 8.4

Bw horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loam, silt loam, or silty clay loam
Clay content: 18 to 35 percent
Calcium carbonate equivalent: 0 to 10 percent
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, silt loam, or silty clay loam

Clay content: 18 to 35 percent
Calcium carbonate equivalent: 10 to 20 percent
Reaction: pH 7.9 to 9.0

160D—Cambeth-Yamacall complex, 8 to 15 percent slopes

Setting

Landform:
- Cambeth—Hills
- Yamacall—Hills

Position on landform:
- Cambeth—Shoulders and summits
- Yamacall—Backslopes and footslopes

Slope:
- Cambeth—8 to 15 percent
- Yamacall—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Cambeth and similar soils: 55 percent
Yamacall and similar soils: 30 percent

Minor Components
Archin and similar soils: 0 to 4 percent
Cabbart and similar soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 3 percent
Very shallow loamy soils: 0 to 2 percent
Soils that have slopes more than 15 percent: 0 to 2 percent

Major Component Description

Cambeth
Surface layer texture: Silt loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

Yamacall
Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

260C—Cambeth-Cabbart silt loams, 2 to 8 percent slopes

Setting

Landform:
- Cambeth—Sedimentary plains
- Cabbart—Sedimentary plains

Position on landform: Backslopes and footslopes

Slope:
- Cambeth—2 to 8 percent
- Cabbart—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Cambeth and similar soils: 60 percent
Cabbart and similar soils: 25 percent

Minor Components
Archin and similar soils: 0 to 4 percent
Twilight and similar soils: 0 to 4 percent
Very shallow loamy soils: 0 to 3 percent
Yamacall and similar soils: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 2 percent

Major Component Description

Cambeth
Surface layer texture: Silt loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

Cabbart
Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 2.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

260E—Cambeth-Cabbart-Yawdim complex, 15 to 25 percent slopes

Setting

Landform:
- Cambeth—Hills
- Cabbart—Hills
- Yawdim—Hills

Position on landform:
- Cambeth—Backslopes and footslopes
- Cabbart—Shoulders and summits
- Yawdim—Shoulders and summits

Slope:
- Cambeth—15 to 25 percent
- Cabbart—15 to 25 percent
- Yawdim—15 to 25 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Cambeth and similar soils: 40 percent
Cabbart and similar soils: 30 percent
Yawdim and similar soils: 15 percent

Minor Components
Archin and similar soils: 0 to 3 percent
Very shallow loamy soils: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Areas of rock outcrop: 0 to 3 percent
Soils that have slopes more than 25 percent: 0 to 2 percent
Soils that have slopes less than 15 percent: 0 to 1 percent

Major Component Description

Cambeth
Surface layer texture: Silt loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

Cabbart
Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches

Yawdim
Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Carfall Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Alluvium
Slope range: 2 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed Pachic Argiborolls

Typical Pedon

Carfall fine sandy loam, 8 to 15 percent slopes, in an area of rangeland, 2,500 feet north and 1,600 feet east of the southwest corner of sec. 1, T. 5 N., R. 55 E.

A—0 to 9 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist;

moderate medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine roots; neutral; clear smooth boundary.

Bt1—9 to 15 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; strong coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky, moderately plastic; many very fine roots; few fine pores; many faint clay films on faces of peds and in pores; neutral; gradual smooth boundary.

Bt2—15 to 20 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; few fine pores; many faint clay films on faces of peds and in pores; neutral; gradual wavy boundary.

BC—20 to 30 inches; light brownish gray (2.5Y 6/2) sandy loam, grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine pores; neutral, gradual wavy boundary.

C—30 to 60 inches; light yellowish brown (2.5Y 6/4) sandy loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 17 to 35 inches

A horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Texture: Loam or fine sandy loam
Clay content: 10 to 25 percent
Reaction: pH 6.1 to 7.3

Bt horizons
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 2 to 4
Texture: Sandy clay loam, clay loam, or loam
Clay content: 20 to 35 percent
Reaction: pH 6.1 to 7.3

BC and C horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Sandy loam or loamy sand
Clay content: 10 to 20 percent
Reaction: pH 6.1 to 7.3

14C—Carfall loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Carfall and similar soils: 85 percent

Minor Components
Yamacall and similar soils: 0 to 4 percent
Delpoint and similar soils: 0 to 4 percent
Busby and similar soils: 0 to 3 percent
Areas of blowouts: 0 to 2 percent
Soils with lighter colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

114C—Carfall-Assinniboine complex, 2 to 8 percent slopes

Setting

Landform:
- Carfall—Sedimentary plains
- Assinniboine—Sedimentary plains

Slope:
- Carfall—2 to 8 percent
- Assinniboine—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Carfall and similar soils: 55 percent
Assinniboine and similar soils: 30 percent

Minor Components
Delpoint and similar soils: 0 to 5 percent
Busby and similar soils: 0 to 5 percent
Soils with lighter colored surface layers: 0 to 5 percent

Major Component Description

Carfall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Assinniboine
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

114D—Carfall-Assinniboine complex, 8 to 15 percent slopes

Setting

Landform:
- Carfall—Hills
- Assinniboine—Hills

Slope:
- Carfall—8 to 15 percent
- Assinniboine—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Carfall and similar soils: 55 percent
Assinniboine and similar soils: 30 percent

Minor Components
Delpoint and similar soils: 0 to 4 percent
Busby and similar soils: 0 to 4 percent
Soils with lighter colored surface layers: 0 to 4 percent
Soils that have slopes more than 15 percent: 0 to 3 percent

Major Component Description

Carfall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Assinniboine
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

214C—Carfall fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Carfall and similar soils: 85 percent

Minor Components
Soils that are calcareous throughout: 0 to 3 percent
Carfall with loam surfaces: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 2 percent
Soils with lighter colored surface layers: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

214D—Carfall fine sandy loam, 8 to 15 percent slopes

Setting

Landform: Hills
Slope: 8 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Carfall and similar soils: 85 percent

Minor Components
Yamacall and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 3 percent
Soils that have slopes more than 15 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Chinook Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Coarse-loamy, mixed Aridic Haploborolls

Typical Pedon

Chinook sandy loam, 2 to 8 percent slopes, in an area of rangeland, 1,500 feet north and 1,600 feet east of the southwest corner of sec. 29, T. 3 S., R. 62 E.

A—0 to 5 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; few very fine and fine pores; neutral; clear smooth boundary.
Bw1—5 to 13 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; few very fine and fine pores; neutral; clear smooth boundary.
Bw2—13 to 24 inches; grayish brown (2.5Y 5/2) sandy loam; dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable, nonsticky, nonplastic; common very fine roots; few very fine pores; slightly alkaline; clear smooth boundary.
Bk1—24 to 35 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; few very fine pores; few fine masses of lime; strongly effervescent; slightly alkaline; gradual smooth boundary.
Bk2—35 to 60 inches; light brownish gray (2.5Y 6/2) sandy loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common fine masses of lime; violently effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
*Depth to the Bk horiz*on: 12 to 35 inches

A horizon
- Hue: 10YR or 2.5Y
- Value: 2 or 3 moist
- Chroma: 2 or 3
- Clay content: 5 to 18 percent
- Content of rock fragments: 0 to 35 percent pebbles
- Reaction: pH 6.6 to 8.4

Bw horizons
- Hue: 10YR or 2.5Y
- Value: 4, 5, or 6 dry; 3, 4, or 5 moist
- Chroma: 2 to 4
- Texture: Fine sandy loam or sandy loam
- Clay content: 5 to 18 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Reaction: pH 6.6 to 8.4

Bk1 horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5, 6, or 7 dry; 4 or 5 moist
- Chroma: 2 to 4
- Texture: Fine sandy loam or sandy loam
- Clay content: 5 to 15 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Calcium carbonate equivalent: 5 to 12 percent
- Reaction: pH 7.4 to 9.0

Bk2 horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5, 6, or 7 dry; 4, 5, or 6 moist
- Chroma: 2 to 4
- Texture: Fine sandy loam or sandy loam
- Clay content: 5 to 15 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Calcium carbonate equivalent: 5 to 15 percent
- Reaction: pH 7.4 to 9.0

83A—Chinook sandy loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Chinook and similar soils: 85 percent

Minor Components
Assinniboine and similar soils: 0 to 3 percent
Eapa and similar soils: 0 to 3 percent
Kremlin and similar soils: 0 to 3 percent
Archin and similar soils: 0 to 3 percent
Soils with gravelly surface layers: 0 to 2 percent
Soils that have slopes more than 2 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

83C—Chinook sandy loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Chinook and similar soils: 85 percent

Minor Components
Assinniboine and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Eapa and similar soils: 0 to 3 percent
Kremlin and similar soils: 0 to 3 percent
Archin and similar soils: 0 to 2 percent
Delpoint and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

83D—Chinook sandy loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 8 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Chinook and similar soils: 85 percent

Minor Components
Busby and similar soils: 0 to 3 percent
Twilight and similar soils: 0 to 3 percent
Soils with gravelly surface layers: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Areas of blowouts: 0 to 2 percent
Soils with lighter colored surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

183C—Chinook-Assinniboine complex, 2 to 8 percent slopes

Setting

Landform:
- Chinook—Alluvial fans and stream terraces
- Assinniboine—Alluvial fans and stream terraces

Position on landform:
- Chinook—Backslopes and footslopes
- Assinniboine—Backslopes and footslopes

Slope:
- Chinook—2 to 8 percent
- Assinniboine—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Chinook and similar soils: 45 percent
Assinniboine and similar soils: 40 percent

Minor Components
Archin and similar soils: 0 to 3 percent
Eapa and similar soils: 0 to 3 percent
Marmarth and similar soils: 0 to 3 percent
Soils with gravelly surface layers: 0 to 3 percent
Areas of blowouts: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 1 percent

Major Component Description

Chinook
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.1 inches

Assinniboine
Surface layer texture: Sandy clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

283C—Chinook-Archin complex, 2 to 8 percent slopes

Setting

Landform:
- Chinook—Alluvial fans and stream terraces
- Archin—Alluvial fans and stream terraces

Slope:
- Chinook—2 to 8 percent
- Archin—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Chinook and similar soils: 45 percent
Archin and similar soils: 40 percent

Minor Components
Busby and similar soils: 0 to 3 percent
Twilight and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 3 percent
Soils with slopes more than 8 percent: 0 to 3 percent

Major Component Description

Chinook
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.1 inches

Archin
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Cohagen Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Soft sandstone bedrock
Slope range: 4 to 15 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents

Typical Pedon

Cohagen fine sandy loam, in an area of Parshall-Cohagen fine sandy loams, 4 to 15 percent slopes, in an area of rangeland, 2,000 feet south and 2,300 feet east of the northwest corner of sec. 29, T. 2 N., R. 62 E.

A—0 to 3 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few fine and many very fine roots; few very fine pores; slightly alkaline; abrupt wavy boundary.

C—3 to 12 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; many very fine roots; 30 percent soft sandstone fragments; disseminated lime; violently effervescent; slightly alkaline; clear wavy boundary.

Cr—12 to 60 inches; light gray (10YR 7/2) soft sandstone bedrock that crushes to fine sandy loam, grayish brown (10YR 5/2) moist.

Range in Characteristics

Depth to the Cr horizon: 10 to 20 inches

A horizon
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3 or 4 moist
Chroma: 2 to 4
Clay content: 10 to 18 percent
Content of rock fragments: 0 to 15 percent soft sandstone fragments
Reaction: pH 7.4 to 8.4

C horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Fine sandy loam or sandy loam
Clay content: 10 to 18 percent
Content of rock fragments: 0 to 50 percent soft sandstone fragments
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 7.4 to 8.4

Creed Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Creed loam, in an area of Creed-Absher complex, 2 to 8 percent slopes, in an area of rangeland, 1,000 feet south and 1,700 feet west of the northeast corner of sec. 8, T. 3 N., R. 56 E.

A—0 to 5 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; strong thin platy structure parting to strong very fine and fine granular; soft, very friable, nonsticky, slightly plastic; few fine and many very fine roots; common very fine and fine pores; neutral; clear smooth boundary.

E—5 to 8 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to moderate thin platy; slightly hard, very friable, nonsticky, slightly plastic; few fine and many very fine roots; few fine and many very fine pores; neutral; abrupt smooth boundary.

Btn—8 to 17 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse columnar structure parting to moderate medium subangular blocky; very hard, firm, very sticky, very plastic; common very fine roots; many very fine tubular pores; many distinct clay films on faces of peds, continuous prominent clay films in pores; slightly alkaline; clear smooth boundary.

Bkn—17 to 30 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, very firm, sticky and plastic; common very fine roots; common very fine tubular pores; common fine masses of lime; violently effervescent; strongly alkaline; gradual wavy boundary.

Bky—30 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, very firm, sticky and plastic; few very fine roots; few very fine pores; many fine nests and seams of gypsum crystals; many fine and medium masses of lime; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bkn horizon: 16 to 20 inches
Depth to the Bky horizon: 25 to 30 inches
Soil phase: Warm
Taxonomic note: Map unit 602C is a taxadjunct to the Creed series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 20 to 27 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.1 to 8.4

E horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, 6, or 7 moist
Chroma: 2 or 3
Clay content: 20 to 27 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.1 to 8.4

Btn horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 2 or 3
Texture: Clay loam, silty clay loam, clay, or silty clay
Clay content: 35 to 55 percent
Content of rock fragments: 0 to 15 percent pebbles
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 8 to 20
Reaction: pH 6.6 to 9.0

Bkn horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Silty clay loam, clay loam, sandy clay loam, loam, or clay
Content of rock fragments: 0 to 15 percent pebbles
Clay content: 27 to 45 percent
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 4 to 8 mmhos/cm
Sodium adsorption ratio: 13 to 20
Gypsum content: 0 to 2 percent
Reaction: pH 7.9 to 9.0

Bky horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loam, clay loam, sandy clay loam, or silty clay loam
Clay content: 25 to 35 percent
Calcium carbonate equivalent: 5 to 10 percent
Content of rock fragments: 0 to 15 percent pebbles
Electrical conductivity: 4 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 25
Gypsum content: 1 to 5 percent
Reaction: pH 7.9 to 9.0

54A—Creed loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Creed and similar soils: 85 percent

Minor Components
Absher and similar soils: 0 to 4 percent
Gerdrum and similar soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 3 percent
Archin and similar soils: 0 to 2 percent
Areas of slickspots: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

54C—Creed loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Creed and similar soils: 85 percent

Minor Components
Absher and similar soils: 0 to 4 percent
Gerdrum and similar soils: 0 to 4 percent
Archin and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 2 percent
Soils with darker colored surface layers: 0 to 1 percent
Soils that have slopes less than 2 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

154C—Creed-Absher complex, 2 to 8 percent slopes

Setting

Landform:
- Creed—Alluvial fans and stream terraces
- Absher—Alluvial fans and stream terraces

Position on landform:
- Creed—Microhighs
- Absher—Microlows

Slope:
- Creed—2 to 8 percent
- Absher—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Creed and similar soils: 55 percent
Absher and similar soils: 30 percent

Minor Components
Gerdrum and similar soils: 0 to 4 percent
Archin and similar soils: 0 to 4 percent
Very deep nonsaline soils: 0 to 3 percent
Areas of slickspots: 0 to 3 percent
Soils with darker colored surface layers: 0 to 1 percent

Major Component Description

Creed
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 inches

Absher
Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

254C—Creed-Gerdrum complex, 2 to 8 percent slopes

Setting

Landform:
- Creed—Alluvial fans and stream terraces
- Gerdrum—Alluvial fans and stream terraces

Position on landform:
- Creed—Microhighs
- Gerdrum—Microlows

Slope:
- Creed—2 to 8 percent
- Gerdrum—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Creed and similar soils: 45 percent
Gerdrum and similar soils: 40 percent

Minor Components
Absher and similar soils: 0 to 4 percent
Yamacall and similar soils: 0 to 4 percent
Kobase and similar soils: 0 to 4 percent
Areas of slickspots: 0 to 3 percent

Major Component Description

Creed
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 inches

Gerdrum
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

602C—Creed-Gerdrum complex, warm, 2 to 6 percent slopes

Setting

Landform:
- Creed—Alluvial fans and stream terraces
- Gerdrum—Alluvial fans and stream terraces

Position on landform:
- Creed—Microhighs
- Gerdrum—Microlows

Slope:
- Creed—2 to 6 percent
- Gerdrum—2 to 6 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Creed and similar soils: 45 percent
Gerdrum and similar soils: 40 percent

Minor Components
Absher and similar soils: 0 to 4 percent
Kobase and similar soils: 0 to 4 percent
Yamacall and similar soils: 0 to 4 percent
Areas of slickspots: 0 to 3 percent

Major Component Description

Creed
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 inches

Gerdrum
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Daglum Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic Vertic Natriborolls

Typical Pedon

Daglum loam, 0 to 4 percent slopes, in an area of rangeland, 2,600 feet south and 800 feet west of the northeast corner of sec. 11, T. 4 S., R. 60 E.

A—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine and many very fine roots; few fine and common very fine pores; slightly acid; clear smooth boundary.

E—6 to 9 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure parting to moderate fine and medium subangular blocky; slightly hard, very friable, slightly sticky, slightly plastic; few fine and many very fine roots; few very fine and fine pores; neutral; abrupt smooth boundary.

Btn1—9 to 13 inches; brown (10YR 5/3) clay, dark grayish brown (10YR 4/2) moist; moderate medium and coarse columnar structure parting to strong fine and medium subangular blocky; extremely hard, very firm, very sticky, very plastic; common very fine roots; few very fine and fine pores; continuous distinct clay films on faces of peds, continuous prominent clay films in pores; moderately alkaline; gradual wavy boundary.

Btn2—13 to 21 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky, very plastic; common very fine roots; few very fine pores; common distinct clay films on faces of peds, continuous distinct clay films in pores; moderately alkaline; gradual wavy boundary.

Bky—21 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse subangular blocky structure; very hard, firm, very sticky, moderately plastic; few very fine roots; few very fine pores; common fine seams and nests of gypsum crystals; common fine masses of lime; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Taxonomic note: Daglum soil, as used in Carter County, is a taxadjunct to the series. It classifies as Fine, montmorillonitic Aridic Natriborolls. Use and management is similar.

A horizon
Value: 3, 4, or 5 dry; 2 or 3 moist
Clay content: 18 to 26 percent
Reaction: pH 5.6 to 7.3

E horizon
Hue: 10YR or 2.5Y
Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist
Chroma: 1 or 2
Clay content: 18 to 26 percent
Reaction: pH 5.6 to 7.3

Btn horizons
Hue: 10YR or 2.5Y
Value: 3, 4, 5, or 6 dry; 2, 3, 4, or 5 moist
Chroma: 2 or 3
Texture: Clay, silty clay, silty clay loam, or clay loam
Clay content: 35 to 60 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 10 to 20
Reaction: pH 6.1 to 9.0

Bky horizon
Hue: 2.5Y or 5Y
Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist
Chroma: 1 to 4
Texture: Clay loam, silty clay, silty clay loam, or clay
Clay content: 35 to 60 percent
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 20
Reaction: pH 7.4 to 9.0

45B—Daglum loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Daglum and similar soils: 85 percent

Minor Components
Absher and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 3 percent
Marvan and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 2 percent
Soils that have slopes more than 4 percent: 0 to 2 percent
Somewhat poorly drained soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Dast Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated, sandy sedimentary beds

Slope range: 4 to 60 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Coarse-loamy, mixed frigid Typic Ustochrepts

Typical Pedon

Dast sandy loam, in an area of Dast-Ridge-Rock outcrop complex, 35 to 60 percent slopes, in an area of forestland, 200 feet south and 1,400 feet east of the northwest corner of sec. 17, T. 3 S., R. 62 E.

Oi—1 inch to 0; slightly decomposed forest litter.
A—0 to 5 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine roots; slightly alkaline; clear smooth boundary.
Bw—5 to 13 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; soft, very friable, nonsticky, nonplastic; many very fine roots; few very fine pores; slightly alkaline; gradual wavy boundary.
Bk—13 to 28 inches; light gray (2.5Y 7/2) sandy loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; soft, very friable, nonsticky, nonplastic; common very fine roots; few fine pores; 30 percent soft channers; few fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.
Cr—28 to 60 inches; white (2.5Y 8/2) semiconsolidated, sandy sedimentary beds that crush to fine sandy loam; light gray (2.5Y 7/2) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 13 to 24 inches
Depth to bedrock: 20 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Clay content: 2 to 18 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 7.4 to 8.4

Bw horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Fine sandy loam, sandy loam, or loam
Clay content: 2 to 18 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Fine sandy loam, sandy loam, or loam
Clay content: 2 to 18 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

125F—Dast-Ridge-Rock outcrop complex, 35 to 60 percent slopes

Setting

Landform:
- Dast—Hills
- Ridge—Hills
- Rock outcrop—Hills

Position on landform:
- Dast—Backslopes
- Ridge—Summits
- Rock outcrop—Shoulders and summits

Slope:
- Dast—35 to 60 percent
- Ridge—35 to 60 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Dast and similar soils: 30 percent
Ridge and similar soils: 30 percent
Rock outcrop: 25 percent

Minor Components
Moderately deep loamy soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 4 percent
Soils that have slopes less than 35 percent: 0 to 4 percent
Soils with flagstones: 0 to 3 percent

Major Component Description

Dast
Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland

Flooding: None
Available water capacity: Mainly 3.6 inches

Ridge
Surface layer texture: Sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.2 inches

Rock outcrop
Definition: Consolidated sandstone

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

225E—Dast-Vebar complex, 15 to 35 percent slopes

Setting

Landform:
- Dast—Hills
- Vebar—Hills

Slope:
- Dast—15 to 35 percent
- Vebar—15 to 35 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Dast and similar soils: 50 percent
Vebar and similar soils: 35 percent

Minor Components
Cabba and similar soils: 0 to 4 percent
Noncalcareous soils: 0 to 4 percent
Areas of rock outcrop: 0 to 3 percent
Sandy textured soils: 0 to 3 percent
Soils with darker colored surface layers: 0 to 1 percent

Major Component Description

Dast
Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.6 inches

Vebar
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

225F—Dast-Vebar complex, 35 to 60 percent slopes

Setting

Landform:
- Dast—Hills
- Vebar—Hills

Slope:
- Dast—35 to 60 percent
- Vebar—35 to 50 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Dast and similar soils: 50 percent
Vebar and similar soils: 35 percent

Minor Components
Shallow sandy soils: 0 to 4 percent
Shallow loamy soils: 0 to 4 percent

Noncalcareous soils: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent
Soils that have slopes less than 35 percent: 0 to 2 percent

Major Component Description

Dast
Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.6 inches

Vebar
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

325E—Dast-Cabba-Mowbray complex, 15 to 35 percent slopes

Setting

Landform:
- Dast—Hills
- Cabba—Hills
- Mowbray—Hills

Slope:
- Dast—15 to 35 percent, north aspect
- Cabba—15 to 35 percent, south aspect
- Mowbray—15 to 35 percent, north aspect

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Dast and similar soils: 35 percent
Cabba and similar soils: 30 percent
Mowbray and similar soils: 20 percent

Minor Components
Very shallow loamy soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 3 percent
Soils that have slopes less than 15 percent: 0 to 3 percent
Soils that have slopes more than 35 percent: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Dast
Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.6 inches

Cabba
Surface layer texture: Very stony loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

Mowbray
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Delpoint Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated, loamy sedimentary beds
Slope range: 2 to 25 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed, frigid Aridic Ustochrepts

Typical Pedon

Delpoint loam, in an area of Delpoint-Cabbart complex, 8 to 15 percent slopes, in an area of rangeland, 1,700 feet south and 900 feet west of the northeast corner of sec. 16, T. 6 S., R. 59 E.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine pores; slightly alkaline; clear wavy boundary.

Bw—5 to 19 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly sticky, moderately plastic; many very fine and fine roots; many very fine pores; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk—19 to 29 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; few fine and common very fine pores; common fine and medium masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Cr—29 to 60 inches; very pale brown (10YR 7/3) semiconsolidated, loamy sedimentary beds that crush to loam, pale brown (10YR 6/3) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 10 to 20 inches
Depth to the Cr horizon: 20 to 40 inches
Other features: In areas that are cultivated, slight to strong effervescence may result from mixing the A and Bw horizons.

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3, 4, or 5 moist
Chroma: 2 to 4
Clay content: 20 to 27 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 8.4

Bw horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or silty clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, sandy loam, clay loam, or silty clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

71C—Delpoint loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Delpoint and similar soils: 85 percent

Minor Components
Cabbart and similar soils: 0 to 4 percent
Yamacall and similar soils: 0 to 3 percent
Kremlin and similar soils: 0 to 3 percent
Soils that are calcareous throughout: 0 to 3 percent
Archin and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

171C—Delpoint-Cabbart complex, 2 to 8 percent slopes

Setting

Landform:
- Delpoint—Sedimentary plains
- Cabbart—Sedimentary plains

Position on landform:
- Delpoint—Backslopes
- Cabbart—Shoulders and summits

Slope:
- Delpoint—2 to 8 percent
- Cabbart—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Delpoint and similar soils: 60 percent
Cabbart and similar soils: 30 percent

Minor Components
Yamacall and similar soils: 0 to 2 percent
Kremlin and similar soils: 0 to 2 percent
Marmarth and similar soils: 0 to 2 percent
Archin and similar soils: 0 to 2 percent
Very shallow loamy soils: 0 to 1 percent
Soils that have slopes more than 8 percent: 0 to 1 percent

Major Component Description

Delpoint
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

Cabbart
Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

171D—Delpoint-Cabbart complex, 8 to 15 percent slopes

Setting

Landform:
- Delpoint—Hills
- Cabbart—Hills

Position on landform:
- Delpoint—Backslopes
- Cabbart—Shoulders and summits

Slope:
- Delpoint—8 to 15 percent
- Cabbart—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Delpoint and similar soils: 50 percent
Cabbart and similar soils: 35 percent

Minor Components
Yamacall and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Blacksheep and similar soils: 0 to 3 percent
Very shallow loamy soils: 0 to 3 percent
Soils that have slopes more than 15 percent: 0 to 3 percent

Major Component Description

Delpoint
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

Cabbart
Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

271D—Delpoint-Yamacall loams, 8 to 15 percent slopes

Setting

Landform:
- Delpoint—Hills
- Yamacall—Hills

Position on landform:
- Delpoint—Backslopes and shoulders
- Yamacall—Footslopes and toeslopes

Slope:
- Delpoint—8 to 15 percent
- Yamacall—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Delpoint and similar soils: 50 percent
Yamacall and similar soils: 35 percent

Minor Components
Cabbart and similar soils: 0 to 4 percent
Cambeth and similar soils: 0 to 4 percent
Very shallow loamy soils: 0 to 3 percent
Soils that are calcareous throughout: 0 to 3 percent
Soils that have slopes more than 15 percent: 0 to 1 percent

Major Component Description

Delpoint
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

Yamacall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

DA—Denied access

Composition

Major Components
Denied access: 100 percent

Major Component Description

Definition: Areas where soil mapping access was denied by the landowner

Eapa Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Eapa loam, 0 to 2 percent slopes, in an area of cropland, 300 feet north and 300 feet east of the southwest corner of sec. 16, T. 3 S., R. 61 E.

Ap—0 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; common very fine pores; neutral; abrupt smooth boundary.

Bt1—8 to 13 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very hard, friable, moderately sticky, moderately plastic; few fine and many very fine roots; many very fine pores; common faint clay films on faces of peds and in pores; neutral; gradual wavy boundary.

Bt2—13 to 24 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong medium subangular blocky; extremely hard, firm, very sticky, very plastic; common very fine roots; few very fine pores; common faint clay films on faces of peds and in pores; slightly alkaline; gradual wavy boundary.

Bk—24 to 60 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, very sticky, moderately plastic; few very fine roots; few very fine tubular pores; many fine and medium masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Bk horizon: 15 to 30 inches
Soil phases: Warm
Taxonomic note: Map unit 603C is a taxadjunct to the Eapa series because the average soil temperature is greater than 47 degrees F.

Ap horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 1 or 2
Clay content: 20 to 30 percent
Reaction: pH 6.1 to 7.8

Bt horizons
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3 or 4 moist
Chroma: 2 to 4
Texture: Loam or clay loam
Clay content: 24 to 34 percent
Reaction: pH 6.1 to 7.8

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 1 to 4
Texture: Loam, clay loam, or sandy clay loam
Clay content: 18 to 30 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

84A—Eapa loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Eapa and similar soils: 85 percent

Minor Components
Ethridge and similar soils: 0 to 3 percent
Kremlin and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 3 percent
Archin and similar soils: 0 to 3 percent
Soils that have slopes more than 2 percent: 0 to 2 percent
Areas of slickspots: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

84C—Eapa loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Eapa and similar soils: 85 percent

Minor Components
Ethridge and similar soils: 0 to 3 percent
Kremlin and similar soils: 0 to 3 percent
Archin and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 3 percent
Areas of slickspots: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

84D—Eapa loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 8 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Eapa and similar soils: 85 percent

Minor Components
Kremlin and similar soils: 0 to 3 percent
Marmarth and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Soils that have slopes less than 8 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

167C—Eapa-Yamacall loams, 2 to 8 percent slopes

Setting

Landform:
- Eapa—Alluvial fans and stream terraces
- Yamacall—Alluvial fans and stream terraces

Slope:
- Eapa—2 to 8 percent
- Yamacall—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Eapa and similar soils: 45 percent
Yamacall and similar soils: 40 percent

Minor Components
Cambeth and similar soils: 0 to 4 percent
Delpoint and similar soils: 0 to 4 percent
Marmarth and similar soils: 0 to 3 percent
Archin and similar soils: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 1 percent

Major Component Description

Eapa
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 11.1 inches

Yamacall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

184C—Eapa-Archin loams, 2 to 8 percent slopes

Setting

Landform:
- Eapa—Alluvial fans
- Archin—Alluvial fans

Slope:
- Eapa—2 to 8 percent
- Archin—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Eapa and similar soils: 45 percent
Archin and similar soils: 40 percent

Minor Components
Cambeth and similar soils: 0 to 4 percent
Busby and similar soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 3 percent
Marmarth and similar soils: 0 to 2 percent
Soils that have slopes less than 2 percent: 0 to 2 percent

Major Component Description

Eapa
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.1 inches

Archin
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

603C—Eapa loam, warm, 1 to 6 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 1 to 6 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Eapa and similar soils: 85 percent

Minor Components
Archin and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Soils that have slopes more than 6 percent: 0 to 3 percent
Areas of slickspots: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Ethridge Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Ethridge loam, 2 to 8 percent slopes, in an area of rangeland, 2,300 feet south and 2,500 feet east of the northwest corner of sec. 24, T. 6 S., R. 55 E.

A—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky, slightly plastic; few fine and coarse and common very fine roots; many very fine pores; slightly acid; clear wavy boundary.

Bt1—6 to 14 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure parting to moderate fine angular blocky; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common very fine pores; continuous distinct clay films on faces of peds, continuous prominent clay films in pores; neutral; clear wavy boundary.

Bt2—14 to 24 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; very hard, firm, very sticky, moderately plastic; common very fine roots; few very fine pores; common faint clay films on faces of peds, common distinct clay films in pores; neutral; clear wavy boundary.

Bk—24 to 29 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; few very fine pores; common fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bky—29 to 60 inches; light olive brown (2.5Y 5/4) clay loam, grayish brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; hard, firm, moderately sticky, slightly plastic; few very fine roots; few very fine pores; few very fine masses, common threads and seams of lime; few fine seams of gypsum; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 14 inches
Taxonomic note: Map unit 626C is a taxadjunct to the Ethridge series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Hue: 10YR or 2.5Y
Value: 2 or 3 moist
Chroma: 2 or 3
Texture: Loam or silty clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.1 to 7.8

Bt horizons
Hue: 10YR or 2.5Y
Value: 3 or 4 moist
Chroma: 2 to 4
Texture: Clay, silty clay, clay loam, or silty clay loam
Clay content: 35 to 45 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 8.4

Bk horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Silty clay loam, loam, or clay loam
Clay content: 25 to 40 percent
Content of rock fragments: 0 to 5 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 9.0

Bky horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Clay loam, silt loam, loam, or silty clay loam

Clay content: 25 to 40 percent
Content of rock fragments: 0 to 5 percent pebbles
Electrical conductivity: 2 to 4 mmhos/cm
Sodium adsorption ratio: 1 to 5
Calcium carbonate equivalent: 5 to 15 percent
Gypsum content: 1 to 3 percent
Reaction: pH 7.4 to 9.0

66C—Ethridge silty clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Ethridge and similar soils: 85 percent

Minor Components
Eapa and similar soils: 0 to 4 percent
Archin and similar soils: 0 to 4 percent
Weingart and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 2 percent
Soils that have darker colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

85A—Ethridge loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Ethridge and similar soils: 85 percent

Minor Components
Eapa and similar soils: 0 to 4 percent
Marias and similar soils: 0 to 4 percent
Archin and similar soils: 0 to 3 percent
Soils with silty clay loam surfaces: 0 to 3 percent
Soils that have slopes more than 2 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

85C—Ethridge loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Ethridge and similar soils: 85 percent

Minor Components
Eapa and similar soils: 0 to 3 percent
Marias and similar soils: 0 to 3 percent
Archin and similar soils: 0 to 3 percent
Soils with silty clay loam surfaces: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium

Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

185A—Ethridge-Daglum complex, 0 to 4 percent slopes

Setting

Landform:
- Ethridge—Alluvial fans and stream terraces
- Daglum—Alluvial fans and stream terraces

Slope:
- Ethridge—0 to 4 percent
- Daglum—0 to 4 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Ethridge and similar soils: 50 percent
Daglum and similar soils: 35 percent

Minor Components
Eapa and similar soils: 0 to 3 percent
Weingart and similar soils: 0 to 3 percent
Absher and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 2 percent
Soils that have slopes more than 4 percent: 0 to 2 percent
Areas of slickspots: 0 to 2 percent

Major Component Description

Ethridge
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches

Daglum
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

626C—Ethridge silty clay loam, warm, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Ethridge and similar soils: 85 percent

Minor Components
Eapa and similar soils: 0 to 4 percent
Weingart and similar soils: 0 to 4 percent
Archin and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 2 percent
Soils with darker colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Gerdrum Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 9 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Gerdrum clay loam, 2 to 8 percent slopes, in an area of rangeland, 1,800 feet north and 1,000 feet east of the southwest corner of sec. 12, T. 3 N., R. 55 E.

A—0 to 2 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; soft, very friable, slightly sticky, slightly plastic; few fine and many very fine roots; slightly alkaline; clear smooth boundary.

E—2 to 4 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; strong thin platy structure parting to strong fine granular; slightly hard, friable, slightly sticky, slightly plastic; few fine and many very fine roots; common very fine and fine pores; slightly alkaline; abrupt smooth boundary.

Btn—4 to 14 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong medium columnar structure parting to strong medium and coarse subangular blocky; extremely hard, firm, very sticky, very plastic; few fine and many very fine roots; few fine and common very fine pores; continuous distinct clay films on faces of peds and in pores; strongly alkaline; clear smooth boundary.

Btkn—14 to 26 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky; slightly hard, firm, moderately sticky, moderately plastic; few fine and common very fine roots; few very fine and fine pores; many faint clay films on faces of peds, many distinct clay films in pores; few fine masses of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bknyz1—26 to 38 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; hard, firm, very sticky, very plastic; few very fine roots; few very fine pores; common fine nests and seams of gypsum crystals; few fine seams and threads of other salts; many fine masses of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bknyz2—38 to 60 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; massive; hard, firm, very sticky, very plastic; few very fine roots; common fine nests and seams of gypsum crystals; few fine seams and threads of other salts; many fine masses of lime; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Btkn horizon: 10 to 24 inches
Soil phases: Warm
Taxonomic note: Map units 602C, 611B, and 611D are taxadjuncts to the Gerdrum series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
- Hue: 10YR or 2.5Y
- Value: 5, 6, or 7 dry; 4 or 5 moist
- Chroma: 2 or 3
- Texture: Clay loam when mixed to 7 inches
- Clay content: 10 to 25 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Reaction: pH 6.6 to 7.8

E horizon
- Hue: 10YR or 2.5Y
- Value: 6 or 7 dry; 4, 5, or 6 moist
- Chroma: 2 or 3
- Clay content: 10 to 25 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Reaction: pH 6.6 to 7.8

Btn horizon
- Hue: 10YR or 2.5Y
- Value: 5, 6, or 7 dry; 4 or 5 moist
- Chroma: 2 to 4
- Texture: Clay, silty clay, or silty clay loam
- Clay content: 35 to 55 percent
- Content of rock fragments: 0 to 10 percent pebbles
- Electrical conductivity: 2 to 8 mmhos/cm
- Sodium adsorption ratio: 10 to 20; pedons with sodium adsorption ratio of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchange acidity at pH 8.2.
- Reaction: pH 7.4 to 9.0

Btkn horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5, 6, or 7 dry; 4, 5, or 6 moist
- Chroma: 2 or 3
- Texture: Clay, silty clay, silty clay loam, or clay loam
- Clay content: 30 to 50 percent
- Content of rock fragments: 0 to 10 percent pebbles
- Calcium carbonate equivalent: 5 to 15 percent
- Electrical conductivity: 8 to 16 mmhos/cm
- Sodium adsorption ratio: 13 to 20
- Reaction: pH 7.9 to 9.0

Bknyz horizons
- Hue: 10YR, 2.5Y, or 5Y
- Value: 4, 5, 6, or 7 dry; 4, 5, or 6 moist
- Chroma: 2 to 4
- Textures: Clay loam, sandy clay loam, clay, or silty clay
- Clay content: 10 to 50 percent
- Content of rock fragments: 0 to 10 percent pebbles
- Calcium carbonate equivalent: 5 to 15 percent
- Electrical conductivity: 8 to 16 mmhos/cm
- Sodium adsorption ratio: 13 to 20
- Gypsum content: 1 to 5 percent
- Reaction: pH 7.9 to 9.0

65A—Gerdrum clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Gerdrum and similar soils: 85 percent

Minor Components
Absher and similar soils: 0 to 4 percent
Weingart and similar soils: 0 to 3 percent
Creed and similar soils: 0 to 3 percent
Kobase and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

65C—Gerdrum clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Gerdrum and similar soils: 85 percent

Minor Components
Absher and similar soils: 0 to 3 percent
Creed and similar soils: 0 to 3 percent
Weingart and similar soils: 0 to 3 percent
Kobase and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

165A—Gerdrum-Absher complex, 0 to 2 percent slopes

Setting

Landform:
- Gerdrum—Alluvial fans and stream terraces
- Absher—Alluvial fans and stream terraces

Position on landform:
- Gerdrum—Microhighs
- Absher—Microlows

Slope:
- Gerdrum—0 to 2 percent
- Absher—0 to 2 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Gerdrum and similar soils: 60 percent
Absher and similar soils: 30 percent

Minor Components
Weingart and similar soils: 0 to 3 percent
Creed and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 2 percent
Kobase and similar soils: 0 to 2 percent

Major Component Description

Gerdrum
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

Absher
Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

165C—Gerdrum-Absher complex, 2 to 8 percent slopes

Setting

Landform:
- Gerdrum—Alluvial fans and stream terraces
- Absher—Alluvial fans and stream terraces

Position on landform:
- Gerdrum—Microhighs
- Absher—Microlows

Slope:
- Gerdrum—2 to 8 percent
- Absher—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Gerdrum and similar soils: 60 percent
Absher and similar soils: 30 percent

Minor Components
Weingart and similar soils: 0 to 3 percent
Creed and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 2 percent
Kobase and similar soils: 0 to 2 percent

Major Component Description

Gerdrum
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

Absher
Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

611B—Gerdrum-Absher complex, warm, 0 to 3 percent slopes

Setting

Landform:
- Gerdrum—Alluvial fans and stream terraces
- Absher—Alluvial fans and stream terraces

Position on landform:
- Gerdrum—Microhighs
- Absher—Microlows

Slope:
- Gerdrum—0 to 3 percent
- Absher—0 to 3 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Gerdrum and similar soils: 60 percent
Absher and similar soils: 30 percent

Minor Components
Weingart and similar soils: 0 to 3 percent
Creed and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 2 percent
Kobase and similar soils: 0 to 2 percent

Major Component Description

Gerdrum
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

Absher
Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

611D—Gerdrum-Absher complex, warm, 3 to 9 percent slopes

Setting

Landform:
- Gerdrum—Alluvial fans and stream terraces
- Absher—Alluvial fans and stream terraces

Position on landform:
- Gerdrum—Microhighs
- Absher—Microlows

Slope:
- Gerdrum—3 to 9 percent
- Absher—3 to 9 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Gerdrum and similar soils: 60 percent
Absher and similar soils: 30 percent

Minor Components
Weingart and similar soils: 0 to 3 percent
Creed and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 2 percent
Kobase and similar soils: 0 to 2 percent

Major Component Description

Gerdrum
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

Absher
Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Glendive Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained or moderately well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Glendive sandy loam, 0 to 2 percent slopes, in an area of rangeland, 1,850 feet south and 100 feet west of the northeast corner of sec. 36, T. 3 S., R. 61 E.

A—0 to 4 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; common very fine roots; few fine and common very fine pores; slightly alkaline; gradual smooth boundary.

C1—4 to 18 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and common very fine roots; few very fine and fine pores; slightly alkaline; gradual wavy boundary.

C2—18 to 36 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few thin strata of loamy sand; disseminated lime; strongly effervescent; slightly alkaline; gradual wavy boundary.

C3—36 to 60 inches; light brownish gray (10YR 6/2) stratified fine sandy loam and loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; disseminated lime; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Soil phases: Saline

A horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 4, 5, or 6 dry; 3, 4, or 5 moist
- Chroma: 2 or 3
- Clay content: 5 to 15 percent
- Electrical conductivity: 0 to 2 mmhos/cm; saline phase: 4 to 8 mmhos/cm
- Sodium adsorption ratio: 0 to 5; saline phase: 13 to 70
- Calcium carbonate equivalent: 0 to 5 percent
- Reaction: pH 6.6 to 9.0

C1 and C2 horizons
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5, 6, or 7 dry; 4, 5, or 6 moist
- Chroma: 2 to 4
- Texture: Loam, silt loam, sandy loam, or fine sandy loam
- Clay content: 5 to 18 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Electrical conductivity: 0 to 4 mmhos/cm; saline phase: 8 to 16 mmhos/cm
- Sodium adsorption ratio: 0 to 5; saline phase: 13 to 70
- Reaction: pH 7.4 to 9.0

C3 horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5, 6, or 7 dry; 4, 5, or 6 moist
- Chroma: 2 to 4
- Texture: Sandy loam or fine sandy loam consisting of thin layers of loam, sandy loam, silt loam, loamy sand, loamy fine sand, and occasionally clay loam
- Clay content: 5 to 18 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Electrical conductivity: 0 to 4 mmhos/cm; saline phase: 8 to 32 mmhos/cm

Sodium adsorption ratio: 0 to 5; saline phase: 13 to 70
Reaction: pH 7.4 to 9.0

61A—Glendive sandy loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Glendive and similar soils: 85 percent

Minor Components
Havre and similar soils: 0 to 4 percent
Hanly and similar soils: 0 to 4 percent
Ryell and similar soils: 0 to 3 percent
Poorly drained and ponded soils: 0 to 2 percent
Areas of channels with steep slopes: 0 to 1 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

161B—Glendive sandy loam, saline, 0 to 4 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 4 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Glendive and similar soils: 85 percent

Minor Components
Havre and similar soils: 0 to 4 percent
Ryell and similar soils: 0 to 4 percent
Hanly and similar soils: 0 to 3 percent
Areas of channels with steep slopes: 0 to 2 percent
Poorly drained and ponded soils: 0 to 2 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Hanly Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Sandy, mixed, frigid Aridic Ustifluvents

Typical Pedon

Hanly fine sandy loam, in an area of Hanly-Ryell fine sandy loams, 0 to 4 percent slopes, in an area of cropland, 2,400 feet north and 1,000 feet west of the southeast corner of sec. 5, T. 2 N., R. 58 E.

Ap—0 to 6 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium granular structure; soft, very friable, nonsticky, nonplastic; common fine and many very fine roots; slightly alkaline; abrupt smooth boundary.
C1—6 to 15 inches; grayish brown (2.5Y 5/2) fine sandy loam consisting of thin strata of sandy

loam and loamy sand, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; common very fine roots; moderately alkaline; clear smooth boundary.

C2—15 to 30 inches; light brownish gray (2.5Y 6/2) loamy sand consisting of thin strata of loamy fine sand and sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky, nonplastic; few very fine roots; disseminated lime; slightly effervescent; moderately alkaline; clear smooth boundary.

C3—30 to 60 inches; light gray (2.5Y 7/2) loamy sand consisting of thin strata of loamy fine sand and sand, light brownish gray (2.5Y 6/2) moist; single grain; loose, nonsticky, nonplastic; disseminated lime; slightly effervescent; moderately alkaline.

Range in Characteristics

Ap horizon

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
Reaction: pH 6.6 to 8.4

C horizons

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Clay content: 5 to 10 percent
Content of rock fragments: 0 to 10 percent pebbles below 40 inches
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 7.4 to 8.4

7B—Hanly-Ryell fine sandy loams, 0 to 4 percent slopes

Setting

Landform:
- Hanly—Flood plains
- Ryell—Flood plains

Slope:
- Hanly—0 to 4 percent
- Ryell—0 to 4 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Hanly and similar soils: 50 percent
Ryell and similar soils: 35 percent

Minor Components
Havre and similar soils: 0 to 5 percent
Glendive and similar soils: 0 to 5 percent
Poorly drained and ponded soils: 0 to 3 percent
Areas of channels with steep slopes: 0 to 2 percent

Major Component Description

Hanly
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 5.9 inches

Ryell
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Haploborolls

Depth class: Deep (40 to 60 inches) to very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour) to moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills (slump area)
Parent material: Alluvium and colluvium
Slope range: 15 to 45 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Aridic Haploborolls

Typical Pedon

Haploborolls, in an area of Ustochrepts-Haploborolls complex, slump, 15 to 45 percent slopes, in an area of rangeland, 950 feet north and 50 feet east of the southwest corner of sec. 8, T. 4 S., R. 60 E.

A—0 to 6 inches; brown (10YR 5/3) channery fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; few very fine pores; 20 percent channers; slightly alkaline; clear smooth boundary.

Bw—6 to 13 inches; brown (10YR 5/3) channery fine sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, slightly plastic; common fine and many very fine roots; few very fine pores; 30 percent channers; disseminated lime; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk—13 to 25 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky, slightly plastic; common very fine and fine roots; few very fine pores; 10 percent channers; 60 percent soft coarse fragments; few fine and medium masses and seams of lime; violently effervescent; moderately alkaline; clear wavy boundary.

C—25 to 60 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; 40 percent soft coarse fragments; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Rock fragments in the control section: 0 to 35 percent channers or flagstones
Soft coarse fragments in the control section: 0 to 80 percent
Depth to calcium carbonate: 0 to 35 inches
Other features: Rock fragments occur in the upper portion of the profile; soft coarse fragments commonly increase with depth.

A horizon
Clay content: 5 to 18 percent
Reaction: pH 6.6 to 7.8

Bw horizon
Clay content: 5 to 18 percent
Reaction: pH 6.6 to 7.8

Bk horizon
Clay content: 5 to 35 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 9.0

C horizon
Clay content: 5 to 35 percent
Reaction: pH 7.4 to 9.0

Harlake Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained or moderately well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 3 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Harlake silty clay loam, 0 to 2 percent slopes, in an area of rangeland, 1,100 feet north and 650 feet east of the southwest corner of sec. 19, T. 5 S., R. 55 E.

A—0 to 10 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure parting to moderate fine and medium granular; hard, firm, very sticky, very plastic; common very fine roots; few very fine pores; moderately alkaline; abrupt smooth boundary.

C1—10 to 27 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; strong medium subangular blocky structure parting to moderate fine and medium granular; hard, very firm, very sticky, very plastic; common very fine roots; few very fine pores; disseminated lime; slightly effervescent; moderately alkaline; clear wavy boundary.

C2—27 to 40 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; massive; hard, very firm, very sticky, moderately plastic; few very fine roots; few thin strata of clay loam; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C3—40 to 60 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; massive; hard, very firm, very sticky, moderately plastic; few very fine roots; few thin strata of clay loam; disseminated lime; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Soil phases: Saline or warm
Taxonomic note: Map units 606B and 608B are taxadjuncts to the Harlake series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Silty clay loam, silty clay, or clay
Clay content: 27 to 55 percent
Electrical conductivity: 0 to 4 mmhos/cm; saline phase: 4 to 8 mmhos/cm
Sodium adsorption ratio: 0 to 8
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 6.6 to 8.4

C1 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay; silty clay, or silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay
Clay content: 35 to 60 percent
Electrical conductivity: 0 to 4 mmhos/cm; saline phase: 8 to 16 mmhos/cm
Sodium adsorption ratio: 4 to 10; saline phase: 13 to 30
Calcium carbonate equivalent: 2 to 10 percent
Reaction: pH 7.4 to 9.0

C2 and C3 horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay; silty clay, or silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay
Clay content: 35 to 60 percent
Electrical conductivity: 0 to 4 mmhos/cm; saline phase: 8 to 16 mmhos/cm
Sodium adsorption ratio: 4 to 10; saline phase: 13 to 30
Calcium carbonate equivalent: 2 to 10 percent
Reaction: pH 7.4 to 9.0

57A—Harlake silty clay, saline, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Harlake and similar soils: 85 percent

Minor Components
Havre and similar soils: 0 to 5 percent
Nonsaline soils: 0 to 5 percent
Soils with silty clay loam surfaces: 0 to 3 percent
Poorly drained and ponded soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

157A—Harlake silty clay loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Harlake and similar soils: 90 percent

Minor Components
Havre and similar soils: 0 to 3 percent
Moderately saline soils: 0 to 3 percent
Moderately sodic soils: 0 to 2 percent
Areas of channels with steep slopes: 0 to 1 percent
Poorly drained and ponded soils: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

606B—Harlake silty clay loam, warm, saline, 0 to 3 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 3 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Harlake and similar soils: 85 percent

Minor Components
Havre and similar soils: 0 to 5 percent
Nonsaline soils: 0 to 4 percent
Soils that are noncalcareous throughout: 0 to 3 percent
Poorly drained and ponded soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

608B—Harlake clay, warm, 0 to 3 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 3 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Harlake and similar soils: 85 percent

Minor Components
Havre and similar soils: 0 to 5 percent
Moderately saline soils: 0 to 3 percent
Moderately sodic soils: 0 to 3 percent
Areas of channels with steep slopes: 0 to 2 percent
Poorly drained and ponded soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Havre Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained or moderately well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Havre loam, 0 to 2 percent slopes, in an area of cropland, 2,150 feet south and 750 feet west of the northeast corner of sec. 9, T. 5 S., R. 62 E.

Ap—0 to 5 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; weak very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots; neutral; abrupt smooth boundary.
C1—5 to 25 inches; pale brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine and fine pores; disseminated lime; slightly effervescent; moderately alkaline; clear smooth boundary.
C2—25 to 60 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine pores; few thin strata of fine sandy loam, loam, and clay loam; disseminated lime; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Soil phases: Saline

Ap horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 15 to 27 percent
Calcium carbonate equivalent: 0 to 5 percent
Electrical conductivity: 0 to 2 mmhos/cm; saline phase: 8 to 16 mmhos/cm
Sodium adsorption ratio: 0 to 4
Reaction: pH 6.1 to 9.0

C1 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam, silt loam, or clay loam that consist of strata of silt loam, fine sandy loam, silty clay loam, and clay loam
Clay content: 18 to 35 percent
Calcium carbonate equivalent: 1 to 10 percent
Electrical conductivity: 0 to 4 mmhos/cm; saline phase: 8 to 16 mmhos/cm
Sodium adsorption ratio: 0 to 4; saline phase: 13 to 30
Reaction: pH 7.4 to 9.0

C2 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam, silt loam, or clay loam that consist of strata of silt loam, fine sandy loam, silty clay loam, and clay loam
Clay content: 18 to 35 percent
Calcium carbonate equivalent: 1 to 10 percent
Electrical conductivity: 0 to 4 mmhos/cm; saline phase: 8 to 16 mmhos/cm
Sodium adsorption ratio: 0 to 4; saline phase: 13 to 30
Reaction: pH 7.4 to 9.0

56A—Havre loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Havre and similar soils: 85 percent

Minor Components
Harlake and similar soils: 0 to 4 percent
Glendive and similar soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 3 percent
Areas of channels with steep slopes: 0 to 2 percent
Moderately saline soils: 0 to 1 percent
Poorly drained and ponded soils: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

156A—Havre loam, saline, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Havre and similar soils: 85 percent

Minor Components
Harlake and similar soils: 0 to 4 percent
Glendive and similar soils: 0 to 4 percent
Nonsaline soils: 0 to 2 percent
Areas of channels with steep slopes: 0 to 2 percent
Soils that are noncalcareous throughout: 0 to 2 percent
Poorly drained and ponded soils: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

256A—Havre-Harlake complex, 0 to 2 percent slopes

Setting

Landform:
- Havre—Flood plains
- Harlake—Flood plains

Slope:
- Havre—0 to 2 percent
- Harlake—0 to 2 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Havre and similar soils: 50 percent
Harlake and similar soils: 40 percent

Minor Components
Glendive and similar soils: 0 to 3 percent
Very deep silt loam soils: 0 to 2 percent
Moderately saline soils: 0 to 2 percent
Areas of channels with steep slopes: 0 to 2 percent
Poorly drained and ponded soils: 0 to 1 percent

Major Component Description

Havre
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.7 inches

Harlake
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Julin Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Hills and sedimentary plains
Parent material: Semiconsolidated shale
Slope range: 6 to 25 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic, acid, frigid Aridic Ustorthents

Typical Pedon

Julin silty clay loam, in an area of Volborg-Julin-Rock outcrop complex, 8 to 25 percent slopes, in an area of rangeland, 2,500 feet north and 200 feet west of the southeast corner of sec. 31, T. 9 S., R. 59 E.

A1—0 to 3 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky, moderately plastic; many very fine and fine roots; few very fine and fine pores; 10 percent soft shale fragments, very strongly acid; clear smooth boundary.

A2—3 to 7 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; few very fine pores; 5 percent soft shale fragments; strongly acid; clear smooth boundary.

C1—7 to 15 inches; light brownish gray (10YR 6/2) silty clay, grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to moderate fine and medium granular; slightly hard, friable, moderately sticky, moderately plastic; few fine and common very fine roots; few very fine and fine pores; 25 percent soft shale fragments; 5 percent hard shale channers; very strongly acid; clear smooth boundary.

C2—15 to 21 inches; pale brown (10YR 6/3) silty clay, brown (10YR 4/3) moist; massive; hard, friable, moderately sticky, moderately plastic; few very fine roots; few very fine pores; 35 percent soft shale fragments; 25 percent hard shale channers; very strongly acid; clear wavy boundary.

C3—21 to 28 inches; light brownish gray (10YR 6/2) silty clay, grayish brown (10YR 4/2) moist; massive; hard, friable, moderately sticky, moderately plastic; few very fine roots; 45 percent soft shale fragments; 20 percent hard shale channers; very strongly acid; clear wavy boundary.

Cr—28 to 60 inches; light brownish gray (10YR 6/2) semiconsolidated shale, dark grayish brown (10YR 4/2) moist; sulphur coats on some shale fragments.

Range in Characteristics

Soil temperature: 44 to 47 degrees F
Depth to the Cr horizon: 20 to 40 inches
Taxonomic note: Map unit 634E is a taxadjunct to the Julin series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizons
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5 or 6 dry; 3 or 4 moist
- Chroma: 1 to 3
- Clay content: 35 to 40 percent
- Content of rock fragments: 0 to 35 percent shale fragments—0 to 25 percent soft shale; 0 to 10 percent hard shale
- Reaction: pH 3.6 to 5.5

C horizons
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5 or 6 dry; 3 or 4 moist
- Chroma: 1 to 3
- Texture: Silty clay or clay
- Clay content: 40 to 55 percent
- Content of rock fragments: 30 to 85 percent shale fragments—25 to 60 percent soft shale; 5 to 25 percent hard shale
- Reaction: pH 3.6 to 5.5

Cr horizon
- Material: Semiconsolidated shale
- Reaction: pH 3.6 to 5.5

Kirby Series

Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Hills
Parent material: Colluvium and residuum from scorio (baked shale and sandstone)

Slope range: 8 to 60 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Loamy-skeletal over fragmental, mixed (calcareous), frigid Aridic Ustorthents

Typical Pedon

Kirby channery loam, in an area of Kirby-Cabbart complex, 8 to 25 percent slopes, in an area of rangeland, 50 feet north and 2,250 feet west of the southeast corner of sec. 21, T. 1 N., R. 62 E.

A—0 to 6 inches; reddish brown (5YR 5/3) channery loam, reddish brown (5YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; 30 percent channers; disseminated lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk—6 to 11 inches; light reddish brown (5YR 6/4) extremely channery loam, yellowish red (5YR 4/6) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots matted between channers; 70 percent channers and 5 percent flagstones; common fine masses of lime; common distinct lime coats on rock fragments; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—11 to 60 inches; yellowish red (5YR 5/6) hard, shattered and fractured scorio, reddish brown (5YR 4/4) moist; few fine roots in fractures; common thin lime coats on lower surfaces of rock fragments in the upper few inches.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to fragmental material: 11 to 20 inches
Other features: The rock fragments in the Kirby soil are called scorio. Scorio is defined as the product resulting from the baking of shale and sandstone bedrock that was adjacent to burning coal beds.

A horizon
Hue: 5YR or 7.5YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 3, 4, or 6
Clay content: 10 to 22 percent
Content of rock fragments: 15 to 70 percent—0 to 5 percent flagstones; 15 to 65 percent channers
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 2.5YR, 5YR, or 7.5YR
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 3, 4, or 6
Texture: Loam or sandy loam
Clay content: 8 to 22 percent
Content of rock fragments: 40 to 90 percent—5 to 20 percent flagstones and cobbles; 35 to 70 percent channers
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 8.4

2C horizon
Features: This horizon consists of highly fractured and displaced scorio. The coloring of this material ranges from reddish gray (10R 6/1) through yellowish red (5YR 4/6). Rock fragments of stones, flagstones, and channers make up 90 to 95 percent of this horizon.

176D—Kirby-Cabbart complex, 8 to 25 percent slopes

Setting

Landform:
- Kirby—Hills
- Cabbart—Hills

Position on landform:
- Kirby—Shoulders and summits
- Cabbart—Backslopes and shoulders

Slope:
- Kirby—8 to 25 percent
- Cabbart—8 to 25 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Kirby and similar soils: 50 percent
Cabbart and similar soils: 35 percent

Minor Components
Bonfri and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Very shallow loamy soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Soils that have slopes more than 25 percent: 0 to 2 percent

Major Component Description

Kirby
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Material weathered from baked sandstone and shale
Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 1.3 inches

Cabbart
Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

276F—Kirby-Blacksheep-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform:
- Kirby—Hills
- Blacksheep—Hills
- Rock outcrop—Hills

Position on landform:
- Kirby—Shoulders and summits
- Blacksheep—Backslopes and shoulders

Slope:
- Kirby—25 to 60 percent
- Blacksheep—25 to 50 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Kirby and similar soils: 40 percent
Blacksheep and similar soils: 35 percent
Rock outcrop: 15 percent

Minor Components
Cabbart and similar soils: 0 to 2 percent
Twilight and similar soils: 0 to 2 percent
Very shallow loamy soils: 0 to 2 percent
Cambeth and similar soils: 0 to 2 percent
Soils with stony surface layers: 0 to 1 percent
Soils that have slopes less than 25 percent: 0 to 1 percent

Major Component Description

Kirby
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Material weathered from baked sandstone and shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

Blacksheep
Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Rock outcrop
Definition: Mainly consolidated baked shale and sandstone

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Kobase Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic, frigid Aridic Ustochrepts

Typical Pedon

Kobase silty clay loam, 2 to 8 percent slopes, in an area of rangeland, 500 feet north and 300 feet west of the southeast corner of sec. 26, T. 4 S., R. 56 E.

A—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure parting to moderate very fine and fine granular; very hard, friable, very sticky, moderately plastic; few medium and common very fine and fine roots; few very fine, fine, and medium pores; neutral; clear smooth boundary.

Bw—5 to 12 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure parting to strong medium subangular blocky; very hard, firm, very sticky, very plastic; common very fine and fine roots; few fine and common very fine pores; disseminated lime; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk—12 to 29 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium and coarse subangular blocky structure; extremely hard, firm, moderately sticky, very plastic; few very fine roots; few very fine and fine pores; common fine masses of lime; violently effervescent; strongly alkaline; gradual wavy boundary.

Bky—29 to 60 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, moderately sticky, very plastic; few very fine roots; few very fine pores; common fine nests of gypsum crystals; common fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 12 to 17 inches
Depth to the Bky horizon: 25 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 27 to 40 percent
Content of rock fragments: 0 to 5 percent pebbles
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 6.6 to 8.4

Bw horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 4
Texture: Silty clay loam, silty clay, or clay
Clay content: 35 to 45 percent
Content of rock fragments: 0 to 5 percent pebbles
Calcium carbonate equivalent: 5 to 10 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Silty clay loam, silty clay, or clay
Clay content: 35 to 45 percent
Content of rock fragments: 0 to 5 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Sodium adsorption ratio: 5 to 10
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.9 to 9.0

Bky horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 1 to 4
Texture: Silty clay loam, silty clay, or clay
Clay content: 35 to 45 percent
Content of rock fragments: 0 to 5 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Sodium adsorption ratio: 8 to 13
Electrical conductivity: 0 to 4 mmhos/cm
Gypsum content: 1 to 5 percent
Reaction: pH 7.9 to 9.0

78A—Kobase silty clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Kobase and similar soils: 85 percent

Minor Components
Marias and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 3 percent
Orinoco and similar soils: 0 to 3 percent
Soils with silt loam surface layers: 0 to 3 percent
Soils with darker colored surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium

Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

78C—Kobase silty clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Kobase and similar soils: 85 percent

Minor Components
Marias and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 3 percent
Orinoco and similar soils: 0 to 3 percent
Soils with silt loam surface layers: 0 to 3 percent
Soils with darker colored surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Kremlin Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed Aridic Haploborolls

Typical Pedon

Kremlin loam, 2 to 8 percent slopes, in an area of cropland, 1,450 feet north and 1,400 feet east of the southwest corner of sec. 9, T. 7 S., R. 55 E.

Ap1—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate fine and medium granular; soft, very friable, slightly sticky, slightly plastic; few medium and many very fine and fine roots; few very fine and fine pores; neutral; clear wavy boundary.

Ap2—4 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate thick platy structure parting to moderate fine subangular blocky; hard, friable, slightly sticky, slightly plastic; few medium and many very fine and fine roots; few very fine pores; neutral; clear smooth boundary.

Bw—8 to 13 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly sticky, slightly plastic; few fine and common very fine roots; few very fine pores; neutral; clear wavy boundary.

Bk1—13 to 32 inches; gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; hard, very friable, slightly sticky, slightly plastic; few very fine roots; few very fine pores; few fine and medium masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—32 to 60 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, moderately sticky, moderately plastic; common fine masses of lime and few medium masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Depth to the Bk horizon: 10 to 24 inches

Ap1 horizon
Hue: 10YR or 2.5Y
Value: 2 or 3 moist
Chroma: 2 or 3
Clay content: 18 to 27 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.1 to 7.8

Ap2 horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 18 to 27 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 7.8

Bw horizon
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3 to 5 moist
Chroma: 2 or 3
Texture: Loam, silt loam, clay loam, or sandy clay loam
Clay content: 18 to 30 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 7.8

Bk1 horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 or 3
Texture: Loam, silt loam, clay loam, or sandy clay loam
Clay content: 18 to 30 percent
Content of rock fragments: 0 to 5 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

Bk2 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, silt loam, clay loam, or sandy clay loam consisting of thin layers of different textures
Clay content: 18 to 30 percent
Content of rock fragments: 0 to 5 percent pebbles
Calcium carbonate equivalent: 5 to 12 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

72A—Kremlin loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Kremlin and similar soils: 85 percent

Minor Components
Eapa and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 2 percent
Soils with gravelly surface layers: 0 to 2 percent
Soils with lighter colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

72C—Kremlin loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Kremlin and similar soils: 85 percent

Minor Components
Eapa and similar soils: 0 to 3 percent
Chinook and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Soils with gravelly surface layers: 0 to 2 percent
Busby and similar soils: 0 to 2 percent
Soils with lighter colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

172C—Kremlin-Cabbart complex, 2 to 8 percent slopes

Setting

Landform:
- Kremlin—Alluvial fans
- Cabbart—Sedimentary plains

Slope:
- Kremlin—2 to 8 percent
- Cabbart—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Kremlin and similar soils: 50 percent
Cabbart and similar soils: 35 percent

Minor Components
Cambeth and similar soils: 0 to 3 percent
Marmarth and similar soils: 0 to 3 percent
Very shallow loamy soils: 0 to 3 percent
Moderately saline soils: 0 to 2 percent
Very deep clayey soils: 0 to 2 percent
Soils with slopes more than 8 percent: 0 to 2 percent

Major Component Description

Kremlin
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.8 inches

Cabbart
Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Marias Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic, frigid Chromic Udic Haplusterts

Typical Pedon

Marias silty clay loam, 0 to 2 percent slopes, in an area of rangeland, 1,900 feet north and 350 feet east of the southwest corner of sec. 2, T. 8 S., R. 60 E.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong very fine granular structure; soft, friable, moderately sticky, moderately plastic; many very

fine and fine roots; slightly alkaline; clear smooth boundary.
Bss1—4 to 10 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium subangular blocky structure; very hard, firm, moderately sticky, very plastic; many very fine and fine roots; few very fine pores; few slickensides; disseminated lime; slightly effervescent; moderately alkaline; gradual smooth boundary.
Bss2—10 to 23 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium subangular blocky structure; very hard, firm, moderately sticky, very plastic; common very fine roots; few very fine pores; few slickensides; disseminated lime; slightly effervescent; moderately alkaline; gradual smooth boundary.
Bssy—23 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky, very plastic; few very fine roots; common distinct slickensides; common fine and medium nests and seams of gypsum crystals; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bssy horizon: 20 to 45 inches
Linear extensibility: .06 to .10 in the upper 30 inches of soil; 1/4- to 2-inch wide cracks to a depth of 20 inches

A horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 1 to 3
Clay content: 27 to 40 percent
Electrical conductivity: 0 to 4 mmhos/cm
Sodium adsorption ratio: 1 to 4
Reaction: pH 7.4 to 8.4

Bss1 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Electrical conductivity: 0 to 4 mmhos/cm
Sodium adsorption ratio: 1 to 4
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 8.4

Bss2 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Electrical conductivity: 0 to 4 mmhos/cm
Sodium adsorption ratio: 1 to 4
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 9.0

Bssy horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 3, 4, or 5 moist
Chroma: 1 to 3
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Gypsum content: 1 to 6 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 4 to 13
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 9.0

94A—Marias silty clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Marias and similar soils: 85 percent

Minor Components
Ethridge and similar soils: 0 to 4 percent
Gerdrum and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

94C—Marias silty clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Marias and similar soils: 85 percent

Minor Components
Ethridge and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 4 percent
Gerdrum and similar soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Marmarth Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains
Parent material: Semiconsolidated, loamy sedimentary beds
Slope range: 2 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Marmarth loam, 2 to 8 percent slopes, in an area of rangeland, 600 feet north and 2,500 feet west of the southeast corner of sec. 36, T. 9 S., R. 62 E.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak very fine subangular blocky structure parting to moderate fine and medium granular; soft, very friable, nonsticky, slightly plastic; common very fine and fine roots; few fine and common very fine pores; neutral; clear smooth boundary.

Bt—4 to 13 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; hard, firm, slightly sticky, moderately plastic; few fine and common very fine roots; few fine and common very fine tubular pores; continuous distinct clay films on faces of peds, continuous prominent clay films in pores; neutral; clear wavy boundary.

Bk1—13 to 18 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, firm, slightly sticky, moderately plastic; few very fine roots; few very fine pores; common fine masses of lime; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk2—18 to 27 inches; light olive gray (5Y 6/2) loam, olive gray (5Y 4/2) moist; weak medium subangular blocky structure; soft, friable, nonsticky, slightly plastic; few very fine roots; many very fine and fine masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Cr—27 to 60 inches; light brownish gray (5Y 6/2) semiconsolidated, loamy sedimentary beds that crush to a sandy loam, olive brown (2.5Y 4/4) moist.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Bk horizon: 12 to 24 inches
Depth to the Cr horizon: 20 to 40 inches
Taxonomic note: Map unit 629C is a taxadjunct to the Marmarth series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Value: 3, 4, or 5 moist
Chroma: 2 or 3
Clay content: 20 to 27 percent
Reaction: pH 6.1 to 7.3

Bt horizon
Hue: 10YR or 2.5Y
Value: 3, 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or sandy clay loam
Clay content: 18 to 35 percent
Reaction: pH 6.1 to 7.8

Bk horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, fine sandy loam, or clay loam
Clay content: 15 to 30 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

81C—Marmarth loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Marmarth and similar soils: 85 percent

Minor Components
Cabbart and similar soils: 0 to 4 percent
Eapa and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Moderately saline soils: 0 to 3 percent
Cambeth and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this pub

629C—Marmarth loam, warm, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Marmarth and similar soils: 85 percent

Minor Components
Cabbart and similar soils: 0 to 4 percent
Cambeth and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Eapa and similar soils: 0 to 3 percent
Moderately saline soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Marvan Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)

Landform: Alluvial fans, stream terraces, and sedimentary plains
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic, frigid Sodic Haplusterts

Typical Pedon

Marvan silty clay, 0 to 2 percent slopes, in an area of cropland, 1,000 feet north and 2,500 feet west of the southeast corner of sec. 1, T. 2 S., R. 58 E.

Ap—0 to 7 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; strong fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; many very fine and fine roots; few very fine and fine pores; disseminated lime; slightly effervescent; slightly alkaline; gradual smooth boundary.

Bss—7 to 18 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure; very hard, firm, moderately sticky, moderately plastic; many very fine and fine roots; few very fine pores; few slickensides; disseminated lime; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bssy—18 to 32 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium subangular blocky structure; extremely hard, very firm, moderately sticky, very plastic; few fine and common very fine roots; few very fine pores; few slickensides; common fine nests and seams of gypsum crystals; disseminated lime; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bssyz—32 to 60 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, moderately sticky, very plastic; few very fine roots; few distinct slickensides; common fine and medium nests and seams of gypsum crystals; few fine seams of other salts; disseminated lime; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bssy horizon: 10 to 24 inches
Soil phases: Warm
Other features: When dry, this soil has 1/4- to 1-inch cracks that extend to a depth of about 20 inches. Slickensides range from few to common in all horizons except the surface.
Taxonomic note: Map units 613B, 614C, and 635C are taxadjuncts to the Marvan series in order to join soils that have an average soil temperature greater than 47 degrees F.

Ap horizon
Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay or silty clay
Clay content: 40 to 60 percent
Electrical conductivity: 0 to 4 mmhos/cm
Sodium adsorption ratio: 0 to 4
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 7.4 to 8.4

Bss horizon
Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay or silty clay
Clay content: 45 to 60 percent
Electrical conductivity: 2 to 4 mmhos/cm
Sodium adsorption ratio: 4 to 13
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 9.0

Bssy horizon
Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay or silty clay
Clay content: 45 to 60 percent
Gypsum content: 1 to 3 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 4 to 13
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 9.0

Bssyz horizon
Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay or silty clay
Clay content: 45 to 60 percent
Gypsum content: 1 to 5 percent
Electrical conductivity: 4 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 38

Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 9.0

89A—Marvan silty clay, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Marvan and similar soils: 85 percent

Minor Components
Kobase and similar soils: 0 to 4 percent
Teigen and similar soils: 0 to 3 percent
Vaeda and similar soils: 0 to 3 percent
Vanda and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

89C—Marvan silty clay, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Marvan and similar soils: 85 percent

Minor Components
Kobase and similar soils: 0 to 3 percent
Teigen and similar soils: 0 to 3 percent
Vaeda and similar soils: 0 to 3 percent
Vanda and similar soils: 0 to 2 percent
Absher and similar soils: 0 to 2 percent
Areas of slickspots: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

613B—Marvan-Vanda clays, warm, 0 to 3 percent slopes

Setting

Landform:
- Marvan—Alluvial fans and stream terraces
- Vanda—Alluvial fans and stream terraces

Slope:
- Marvan—0 to 3 percent
- Vanda—0 to 3 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Marvan and similar soils: 45 percent
Vanda and similar soils: 40 percent

Minor Components
Very deep nonsaline soils: 0 to 4 percent
Vaeda and similar soils: 0 to 3 percent
Gerdrum and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 3 percent
Soils that have slopes more than 3 percent: 0 to 2 percent

Major Component Description

Marvan
Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.9 inches

Vanda
Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

614C—Marvan clay, warm, 0 to 6 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 6 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Marvan and similar soils: 85 percent

Minor Components
Yamacall and similar soils: 0 to 4 percent
Absher and similar soils: 0 to 3 percent
Vaeda and similar soils: 0 to 3 percent
Kobase and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 2 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

635C—Marvan-Bascovy clays, warm, 0 to 6 percent slopes

Setting

Landform:
- Marvan—Alluvial fans
- Bascovy—Sedimentary plains

Slope:
- Marvan—0 to 6 percent
- Bascovy—0 to 6 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Marvan and similar soils: 50 percent
Bascovy and similar soils: 35 percent

Minor Components
Neldore and similar soils: 0 to 4 percent
Kobase and similar soils: 0 to 3 percent
Orinoco and similar soils: 0 to 3 percent
Soils that have slopes more than 6 percent: 0 to 3 percent
Marias and similar soils: 0 to 2 percent

Major Component Description

Marvan
Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.9 inches

Bascovy
Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

M-W—Miscellaneous water

Composition

Major Components
Miscellaneous Water: 100 percent

Major Component Description

Definition: Open water in areas such as sewage lagoons, industrial waste pits, and fish hatcheries

Mowbray Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Hills
Parent material: Colluvium
Slope range: 15 to 60 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Loamy-skeletal, mixed, frigid Typic Ustochrepts

Typical Pedon

Mowbray very channery loam, in an area of Mowbray-Cabba-Vebar complex, 35 to 60 percent slopes, in an area of forestland, 2,150 feet north and 1,400 feet east of the southwest corner of sec. 5, T. 3 S., R. 62 E.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.
A—0 to 2 inches; dark grayish brown (2.5Y 4/2) very channery loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; few fine and many very fine pores; 20 percent channers, 10 percent flagstones, and 5 percent cobbles; neutral; abrupt smooth boundary.
Bw—2 to 11 inches; olive (5Y 5/3) very channery loam, olive (5Y 4/3) moist; moderate coarse subangular blocky structure parting to moderate fine granular; hard, very friable, slightly sticky, slightly plastic; few coarse and many very fine, fine, and medium roots; common fine and many very fine pores; 20 percent channers, 15 percent flagstones, and 10 percent cobbles; neutral; clear smooth boundary.
Bk—11 to 22 inches; olive (5Y 5/3) very flaggy loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; few coarse and common very fine and fine roots; common very fine pores; 20 percent flagstones, 15 percent cobbles, and 15 percent channers; 40 percent soft channers; many distinct lime coats on coarse fragments; violently effervescent; slightly alkaline; gradual wavy boundary.
BC—22 to 60 inches; grayish brown (2.5Y 5/2) very flaggy loam, dark grayish brown (2.5Y 4/2) moist; weak very thin platy structure; soft, very friable, slightly sticky, slightly plastic; few fine, medium, and coarse roots; few very fine pores; 30 percent flagstones, 10 percent cobbles, 10 percent channers, and 20 percent soft channers; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 10 to 20 inches

A horizon
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 2, 3, or 4 moist
Chroma: 2 or 3
Clay content: 15 to 25 percent
Content of rock fragments: 35 to 60 percent—5 to 10 percent cobbles; 10 to 20 percent flagstones; 20 to 35 percent channers
Reaction: pH 6.6 to 7.8

Bw horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam or sandy loam
Clay content: 15 to 27 percent
Content of rock fragments: 30 to 65 percent—0 to 10 percent cobbles; 15 to 25 percent flagstones; 20 to 45 percent channers

Soft fragments: 0 to 20 percent
Reaction: pH 6.6 to 7.8

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam or sandy loam
Clay content: 15 to 27 percent
Content of rock fragments: 40 to 80 percent—0 to 15 percent cobbles; 15 to 25 percent flagstones; 15 to 45 percent channers
Soft fragments: 10 to 40 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

BC horizon
Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Clay content: 15 to 27 percent
Content of rock fragments: 35 to 65 percent—0 to 10 percent cobbles; 25 to 35 percent flagstones; 10 to 25 percent channers
Soft coarse fragments: 10 to 40 percent
Calcium carbonate equivalent: 0 to 15 percent
Reaction: pH 7.4 to 8.4

152F—Mowbray-Cabba-Vebar complex, 35 to 60 percent slopes

Setting

Landform:
- Mowbray—Hills
- Cabba—Hills
- Vebar—Hills

Slope:
- Mowbray—35 to 60 percent
- Cabba—35 to 60 percent
- Vebar—35 to 50 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Mowbray and similar soils: 35 percent
Cabba and similar soils: 25 percent
Vebar and similar soils: 25 percent

Minor Components
Dast and similar soils: 0 to 4 percent
Areas of rock outcrop: 0 to 3 percent
Very shallow loamy soils: 0 to 3 percent
Soils with darker colored surface layers: 0 to 3 percent
Soils that have slopes more than 60 percent: 0 to 2 percent

Major Component Description

Mowbray
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

Cabba
Surface layer texture: Very stony loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

Vebar
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Moyerson Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated shale
Slope range: 4 to 50 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Clayey, montmorillonitic (calcareous), frigid, shallow Ustic Torriorthents

Typical Pedon

Moyerson silty clay loam, in an area of Rock outcrop-Moyerson complex, 15 to 50 percent slopes, in an area of rangeland, 1,200 feet north and 1,400 feet west of the southeast corner of sec. 27, T. 6 S., R. 58 E.

A—0 to 4 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure parting to strong fine granular; hard, friable, moderately sticky, slightly plastic; many very fine and fine roots; few fine and common very fine pores; disseminated lime; strongly effervescent; slightly alkaline; gradual wavy boundary.

C1—4 to 8 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to strong very fine subangular blocky; hard, friable, moderately sticky, slightly plastic; common very fine roots; few very fine and fine tubular pores; few fine masses, nests, and seams of gypsum crystals; few fine seams and nests of other salts crystals; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

C2—8 to 14 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, moderately sticky, moderately plastic; few very fine roots; disseminated lime; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cr—14 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated shale that crushes to silty clay loam, grayish brown (2.5Y 5/2) moist.

Range in Characteristics

Depth to the Cr horizon: 10 to 20 inches
Soil phases: Saline or warm
Taxonomic note: The Moyerson soil is a taxadjunct to the series. It classifies as Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents. Use and management are similar. Map unit 605E is a taxadjunct to the Moyerson series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Hue: 5Y, 2.5Y, 10YR, or 7.5YR
Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist
Chroma: 1 to 4
Clay content: 30 to 40 percent
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.4 to 8.4

C1 horizon
Hue: 5Y, 2.5Y, 10YR, or 7.5YR
Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist
Chroma: 1 to 4
Clay content: 35 to 60 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 5 to 13
Gypsum content: 1 to 5 percent
Reaction: pH 7.4 to 8.4

C2 horizon
Hue: 5Y, 2.5Y, 10YR, or 7.5YR
Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist
Chroma: 1 to 4
Clay content: 35 to 60 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 5 to 13
Reaction: pH 7.4 to 8.4

77D—Moyerson silty clay loam, 4 to 15 percent slopes

Setting

Landform: Sedimentary plains and hills
Slope: 4 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Moyerson and similar soils: 85 percent

Minor Components
Very shallow clayey soils: 0 to 4 percent
Neldore and similar soils: 0 to 4 percent
Bascovy and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: Mainly 1.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

277D—Moyerson-Orinoco silty clay loams, 4 to 15 percent slopes

Setting

Landform:
- Moyerson—Sedimentary plains and hills
- Orinoco—Hills

Position on landform:
- Moyerson—Shoulders and summits
- Orinoco—Backslopes and footslopes

Slope:
- Moyerson—4 to 15 percent
- Orinoco—4 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Moyerson and similar soils: 50 percent
Orinoco and similar soils: 40 percent

Minor Components
Very shallow clayey soils: 0 to 3 percent
Bascovy and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 2 percent
Vanda and similar soils: 0 to 2 percent

Major Component Description

Moyerson
Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: Mainly 1.8 inches

Orinoco
Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

477E—Moyerson silty clay loam, 15 to 35 percent slopes

Setting

Landform: Hills
Slope: 15 to 35 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Moyerson and similar soils: 85 percent

Minor Components
Very shallow clayey soils: 0 to 4 percent
Neldore and similar soils: 0 to 4 percent
Bascovy and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: Mainly 1.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

605E—Moyerson, warm-Rock outcrop complex, 9 to 45 percent slopes

Setting

Landform:
- Moyerson—Hills
- Rock outcrop—Hills

Slope: 9 to 45 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Moyerson and similar soils: 55 percent
Rock outcrop: 30 percent

Minor Components
Very shallow clayey soils: 0 to 4 percent
Neldore and similar soils: 0 to 4 percent
Bascovy and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 3 percent

Major Component Description

Moyerson
Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: Mainly 1.8 inches

Rock outcrop
Definition: Consolidated shale

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Neldore Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated shale
Slope range: 3 to 45 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents

Typical Pedon

Neldore clay, in an area of Neldore-Rock outcrop complex, 15 to 45 percent slopes, in an area of rangeland, 250 feet south and 485 feet west of the northeast corner of sec. 26, T. 9 S., R. 58 E.

A—0 to 2 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak medium platy structure parting to strong fine granular; hard, firm, very sticky, very plastic; few fine and many very fine roots; few very fine and fine pores; neutral; clear smooth boundary.
C1—2 to 6 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, very sticky, very plastic; few fine and common very fine roots; few very fine pores; slightly alkaline; gradual smooth boundary.
C2—6 to 12 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; massive; hard, firm, very sticky, very plastic; few very fine roots; slightly alkaline; gradual wavy boundary.
Cr—12 to 60 inches; dark gray (10YR 4/1) semiconsolidated shale, very dark gray (10YR 3/1) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr horizon: 10 to 20 inches
Taxonomic note: Map units 625E and 633D are taxadjuncts to the Neldore series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 1 or 2
Clay content: 40 to 50 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 5.6 to 7.8

C1 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 or 2; 4 or 6 for stains of shale
Texture: Clay or silty clay
Clay content: 40 to 50 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 5.6 to 7.8

C2 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 4
Texture: Clay or silty clay
Clay content: 40 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 5.6 to 7.8

Cr horizon
Features: The shale fragments are extremely hard or very hard when dry and extremely firm or very firm when moist.
Reaction: pH 5.1 to 7.3

58D—Neldore-Rock outcrop complex, 4 to 15 percent slopes

Setting

Landform:
- Neldore—Sedimentary plains and hills
- Rock outcrop—Hills

Slope: 4 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Neldore and similar soils: 50 percent
Rock outcrop: 35 percent

Minor Components
Volborg and similar soils: 0 to 4 percent
Bascovy and similar soils: 0 to 4 percent
Very shallow clayey soils: 0 to 3 percent
Orinoco and similar soils: 0 to 2 percent
Vaeda and similar soils: 0 to 2 percent

Major Component Description

Neldore
Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

Rock outcrop
Definition: Consolidated shale

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

58E—Neldore-Rock outcrop complex, 15 to 45 percent slopes

Setting

Landform:
- Neldore—Hills
- Rock outcrop—Hills

Slope: 15 to 45 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Neldore and similar soils: 45 percent
Rock outcrop: 40 percent

Minor Components
Volborg and similar soils: 0 to 4 percent
Bascovy and similar soils: 0 to 4 percent
Very shallow clayey soils: 0 to 3 percent
Orinoco and similar soils: 0 to 2 percent
Vaeda and similar soils: 0 to 2 percent

Major Component Description

Neldore
Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

Rock outcrop
Definition: Consolidated shale

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

158D—Neldore clay, 4 to 15 percent slopes

Setting

Landform: Hills
Slope: 15 to 35 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Neldore and similar soils: 85 percent

Minor Components
Volborg and similar soils: 0 to 4 percent
Bascovy and similar soils: 0 to 3 percent
Very shallow clayey soils: 0 to 3 percent
Vaeda and similar soils: 0 to 2 percent
Yawdim and similar soils: 0 to 2 percent
Soils that have slopes more than 35 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

158E—Neldore clay, 15 to 35 percent slopes

Setting

Landform: Sedimentary plains and hills
Slope: 4 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Neldore and similar soils: 85 percent

Minor Components
Volborg and similar soils: 0 to 4 percent
Bascovy and similar soils: 0 to 3 percent
Very shallow clayey soils: 0 to 3 percent
Yawdim and similar soils: 0 to 2 percent
Vaeda and similar soils: 0 to 2 percent
Soils that have slopes more than 15 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

258D—Neldore-Volborg clays, 4 to 15 percent slopes

Setting

Landform:
- Neldore—Sedimentary plains and hills
- Volborg—Sedimentary plains and hills

Slope:
- Neldore—4 to 15 percent
- Volborg—4 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Neldore and similar soils: 50 percent
Volborg and similar soils: 35 percent

Minor Components
Bascovy and similar soils: 0 to 4 percent
Very shallow clayey soils: 0 to 3 percent
Areas of rock outcrop: 0 to 3 percent
Areas of blowouts: 0 to 3 percent
Yawdim and similar soils: 0 to 2 percent

Major Component Description

Neldore
Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 1.8 inches

Volborg
Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

358D—Neldore-Bascovy clays, 4 to 15 percent slopes

Setting

Landform:
- Neldore—Sedimentary plains and hills
- Bascovy—Sedimentary plains and hills

Position on landform:
- Neldore—Shoulders and summits
- Bascovy—Backslopes and shoulders

Slope:
- Neldore—4 to 15 percent
- Bascovy—4 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Neldore and similar soils: 45 percent
Bascovy and similar soils: 40 percent

Minor Components
Yawdim and similar soils: 0 to 4 percent
Areas of rock outcrop: 0 to 3 percent
Orinoco and similar soils: 0 to 3 percent
Bickerdyke and similar soils: 0 to 2 percent
Vaeda and similar soils: 0 to 2 percent
Very shallow clayey soils: 0 to 1 percent

Major Component Description

Neldore
Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

Bascovy
Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

625E—Neldore clay, warm, 3 to 25 percent slopes

Setting

Landform: Sedimentary plains and hills
Slope: 3 to 25 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Neldore and similar soils: 85 percent

Minor Components
Volborg and similar soils: 0 to 4 percent
Bascovy and similar soils: 0 to 3 percent
Very shallow clayey soils: 0 to 3 percent
Vaeda and similar soils: 0 to 2 percent
Yawdim and similar soils: 0 to 2 percent
Soils that have slopes more than 25 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Noonan Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 4 to 15 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Fine-loamy, mixed Aridic Natriborolls

Typical Pedon

Noonan loam, in an area of Shambo-Noonan loams, 4 to 15 percent slopes, in an area of rangeland, 1,800 feet south and 2,500 feet west of the northeast corner of sec. 10, T. 3 S., R. 62 S.

A1—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; few fine and common very fine pores; neutral; clear wavy boundary.

A2—8 to 11 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate thick platy structure; slightly hard, very friable, nonsticky, slightly plastic; common very fine roots; few fine and common very fine pores; slightly alkaline; abrupt wavy boundary.

Btn—11 to 16 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong coarse columnar structure; very hard, firm, moderately sticky, moderately plastic; few very fine roots; few very fine pores; common faint clay films on faces of peds and in pores; strongly alkaline; clear wavy boundary.

Bk1—16 to 25 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; strong coarse subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; few very fine pores; few fine masses and seams of lime; violently effervescent; strongly alkaline; clear smooth boundary.

Bk2—25 to 35 inches; pale olive (5Y 6/3) sandy clay loam, olive (5Y 5/3) moist; strong coarse prismatic structure; hard, friable, moderately sticky, moderately plastic; few very fine roots; common very fine pores; few fine masses and seams of lime; violently effervescent; strongly alkaline; clear smooth boundary.

BC—35 to 60 inches; pale olive (5Y 6/4) sandy clay loam, olive (5Y 5/4) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine roots; few very fine pores; disseminated lime; violently effervescent; strongly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Bk horizon: 13 to 30 inches

A horizons
Value: 3, 4, or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 15 to 27 percent
Reaction: pH 6.1 to 7.8

Btn horizon
Hue: 10YR or 2.5Y
Value: 3, 4, 5, or 6 dry; 2, 3, or 4 moist
Chroma: 2 to 4
Clay content: 27 to 35 percent
Electrical conductivity: 0 to 2 mmhos/cm
Sodium adsorption ratio: 13 to 30
Reaction: pH 7.4 to 9.0

Bk horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or sandy clay loam
Clay content: 20 to 30 percent
Electrical conductivity: 0 to 2 mmhos/cm
Sodium adsorption ratio: 13 to 30
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 9.0

BC horizon
Hue: 2.5Y or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Clay content: 20 to 30 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 13 to 30

Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 9.0

Orinoco Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated shale
Slope range: 2 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents

Typical Pedon

Orinoco silty clay loam, 2 to 8 percent slopes, in an area of rangeland, 2,200 feet north and 1,850 feet east of the southwest corner of sec. 9, T. 9 S., R. 61 E.

A—0 to 2 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; soft, friable, moderately sticky, moderately plastic; common very fine roots; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

Bw—2 to 9 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; hard, firm, moderately sticky, moderately plastic; common very fine roots; common fine pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bky1—9 to 22 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine pores; common very fine nests and seams of gypsum crystals; many fine masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bky2—22 to 32 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, moderately sticky, moderately plastic; few very fine roots; common very fine pores; many fine gypsum crystals; few fine masses of lime; slightly effervescent; moderately alkaline; gradual smooth boundary.

Cr—32 to 60 inches; gray (10YR 5/1) semiconsolidated shale, dark gray (10YR 4/1) moist.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Depth to the Bky horizon: 6 to 10 inches
Depth to the Cr horizon: 20 to 40 inches
Taxonomic note: Map unit 631D is a taxadjunct to the Orinoco series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Value: 5 or 6 dry; 4 or 5 moist
Clay content: 30 to 40 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 7.4 to 8.4

Bw horizon
Value: 5 or 6 dry; 4 or 5 moist
Texture: Silty clay loam or silty clay
Clay content: 35 to 45 percent
Electrical conductivity: 4 to 8 mmhos/cm
Sodium adsorption ratio: 5 to 15
Reaction: pH 7.9 to 8.4

Bky horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 or 2
Texture: Silty clay loam, clay, or silty clay
Clay content: 35 to 45 percent
Content of rock fragments: 0 to 5 percent pebbles
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 15 to 30
Calcium carbonate equivalent: 5 to 15 percent
Gypsum content: 1 to 5 percent
Reaction: pH 7.9 to 8.4

Cr horizon
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 15 to 30
Reaction: pH 6.1 to 7.8

53C—Orinoco silty clay loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Orinoco and similar soils: 85 percent

Minor Components
Neldore and similar soils: 0 to 5 percent
Kobase and similar soils: 0 to 5 percent
Yawdim and similar soils: 0 to 3 percent
Bascovy and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

153D—Orinoco-Yawdim silty clay loams, 4 to 15 percent slopes

Setting

Landform:
- Orinoco—Sedimentary plains and hills
- Yawdim—Sedimentary plains and hills

Position on landform:
- Orinoco—Backslopes
- Yawdim—Summits

Slope:
- Orinoco—4 to 15 percent
- Yawdim—4 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Orinoco and similar soils: 50 percent
Yawdim and similar soils: 35 percent

Minor Components
Kobase and similar soils: 0 to 3 percent
Neldore and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Absher and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 2 percent
Areas of slickspots: 0 to 1 percent

Major Component Description

Orinoco
Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.8 inches

Yawdim
Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

253D—Orinoco-Weingart complex, 4 to 15 percent slopes

Setting

Landform:
- Orinoco—Sedimentary plains and hills
- Weingart—Sedimentary plains and hills

Slope:
- Orinoco—4 to 15 percent
- Weingart—4 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Orinoco and similar soils: 45 percent
Weingart and similar soils: 40 percent

Minor Components
Neldore and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 3 percent
Absher and similar soils: 0 to 3 percent
Kobase and similar soils: 0 to 2 percent
Areas of slickspots: 0 to 1 percent

Major Component Description

Orinoco
Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.8 inches

Weingart
Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

631D—Orinoco-Yawdim silty clay loams, warm, 4 to 15 percent slopes

Setting

Landform:
- Orinoco—Sedimentary plains and hills
- Yawdim—Sedimentary plains and hills

Position on landform:
- Orinoco—Backslopes
- Yawdim—Summits

Slope:
- Orinoco—4 to 15 percent
- Yawdim—4 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Orinoco and similar soils: 50 percent
Yawdim and similar soils: 35 percent

Minor Components
Neldore and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 3 percent
Absher and similar soils: 0 to 3 percent
Very shallow clayey soils: 0 to 3 percent
Kobase and similar soils: 0 to 2 percent
Areas of slickspots: 0 to 1 percent

Major Component Description

Orinoco
Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.8 inches

Yawdim
Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Parchin Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains
Parent material: Semiconsolidated, loamy sedimentary beds
Slope range: 2 to 8 percent
Annual precipitation: 12 to 17 inches

Taxonomic Class: Fine-loamy, mixed Borollic Natrargids

Typical Pedon

Parchin fine sandy loam, in an area of Parchin fine sandy loam, 2 to 8 percent slopes, in an area of rangeland, 500 feet south and 40 feet west of the northeast corner of sec. 11, T. 5 S., R. 62 E.

A—0 to 6 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine roots; neutral; abrupt smooth boundary.

E—6 to 11 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots; few very fine and fine pores; neutral; abrupt smooth boundary.

Btn—11 to 17 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate coarse columnar structure parting to strong fine and medium subangular blocky; very hard, firm, slightly sticky, moderately plastic; few very fine and fine roots; few fine and common very fine pores; many distinct clay films on faces of peds and in pores; moderately alkaline; gradual wavy boundary.

Btkn—17 to 22 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate coarse prismatic structure parting to strong medium subangular blocky; very hard, very firm, sticky and plastic; few very fine and fine roots; few very fine and fine pores; few faint clay films on faces of peds and common distinct clay films in pores; many fine and medium masses of lime; moderately alkaline; gradual wavy boundary.

Bk—22 to 28 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; massive, very hard, moderately sticky, moderately plastic; many fine and medium masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

Cr—28 to 60 inches; brown (10YR 5/3) semiconsolidated loamy sedimentary beds that crush to sandy clay loam, brown (10YR 4/3) moist.

Range in Characteristics

Depth to the Bk horizon: 13 to 25 inches
Depth to the Cr horizon: 20 to 40 inches
Other features: Fine threads of gypsum or other salts are present in the lower part of the Btn horizon in some pedons. Pedons with sodium adsorption ratios of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchangeable acidity at pH 8.2. Some pedons contain few or common threads and nests of gypsum and other salts.
Taxonomic note: The Parchin soil is a taxadjunct to the series. It classifies as Fine-loamy, mixed Typic Natriboralfs. Map units 116C and 231D are taxadjuncts to the Parchin series. These soils receive more precipitation than is normal for the series, but this does not affect the use and management.

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Reaction: pH 5.6 to 7.3

E horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Reaction: pH 5.6 to 7.3

Btn horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay loam, sandy clay loam, or loam
Clay content: 25 to 34 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 13 to 20
Reaction: pH 7.9 to 9.0

Btkn and Bk horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 3 to 5 moist
Chroma: 2 or 3
Texture: Clay loam, sandy clay loam, or loam
Clay content: 20 to 30 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 13 to 20
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

21C—Parchin fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Parchin and similar soils: 85 percent

Minor Components
Cabbart and similar soils: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Kobase and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 3 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

121C—Parchin-Bullock complex, 2 to 8 percent slopes

Setting

Landform:
- Parchin—Sedimentary plains
- Bullock—Sedimentary plains

Slope:
- Parchin—2 to 8 percent
- Bullock—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Parchin and similar soils: 50 percent
Bullock and similar soils: 35 percent

Minor Components
Delpoint and similar soils: 0 to 4 percent
Cabbart and similar soils: 0 to 3 percent
Bascovy and similar soils: 0 to 3 percent
Soils with darker colored surface layers: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 2 percent

Major Component Description

Parchin
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.0 inches

Bullock
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Parshall Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Alluvial fans, stream terraces, and drainageways
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Coarse-loamy, mixed Pachic Haploborolls

Typical Pedon

Parshall fine sandy loam, in an area of Parshall-Cohagen fine sandy loams, 4 to 15 percent slopes, in an area of rangeland, 1,400 feet south and 300 feet west of the northeast corner of sec. 17, T. 4 S., R. 60 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak thin platy structure; soft, very friable, nonsticky, slightly plastic; many very fine and fine roots; few very fine pores; neutral; abrupt smooth boundary.
A2—3 to 7 inches; dark brown (10YR 4/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common fine and many very fine roots; few very fine and fine pores; neutral; clear smooth boundary.
Bw—7 to 32 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky, slightly plastic; few very fine and common fine roots; few very fine pores; neutral; abrupt smooth boundary.
Bk—32 to 42 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; soft, very friable, nonsticky, slightly plastic; few very fine roots; few very fine pores; few fine masses of lime; strongly effervescent; moderately alkaline; abrupt smooth boundary.
Ab—42 to 47 inches; light brownish gray (2.5Y 6/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; moderate coarse subangular blocky structure; soft, very friable, nonsticky, slightly plastic; few very fine roots; few very fine pores; disseminated lime, strongly effervescent; moderately alkaline; clear smooth boundary.
Bkb—47 to 60 inches; light gray (2.5Y 7/2) fine sandy loam, light olive brown (2.5Y 5/2) moist; weak medium platy structure; soft, very friable, nonsticky, slightly plastic; few very fine roots; few very fine pores; few fine seams and masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 17 to 40 inches
Depth to the Bk horizon: 24 to 60 inches
Other features: Some pedons do not have buried horizons (Ab or Bkb horizons).

A horizons
Value: 2, 3, 4, or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Texture: Fine sandy loam or sandy loam
Clay content: 10 to 18 percent
Reaction: pH 6.6 to 7.3

Bw horizon
Hue: 10YR or 2.5Y
Value: 3, 4, 5, or 6 dry; 2, 3, 4, or 5 moist
Chroma: 2 to 4
Texture: Fine sandy loam, sandy loam, loam, or loamy fine sand
Clay content: 10 to 18 percent
Reaction: pH 6.6 to 7.8

Bk horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Fine sandy loam, loamy fine sand, or loamy sand
Clay content: 5 to 18 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Ab and Bkb horizons
Clay content: 5 to 18 percent
Reaction: pH 7.4 to 8.4

36A—Parshall sandy loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 4 percent
Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Parshall and similar soils: 85 percent

Minor Components
Chinook and similar soils: 0 to 4 percent
Assinniboine and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Marmarth and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

36D—Parshall fine sandy loam, 4 to 15 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 4 to 15 percent
Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Parshall and similar soils: 85 percent

Minor Components
Chinook and similar soils: 0 to 4 percent
Assinniboine and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Marmarth and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

136D—Parshall-Cohagen fine sandy loams, 4 to 15 percent slopes

Setting

Landform:
- Parshall—Alluvial fans, stream terraces, and drainageways
- Cohagen—Sedimentary plains and hills

Slope:
- Parshall—4 to 15 percent
- Cohagen—4 to 15 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Parshall and similar soils: 50 percent
Cohagen and similar soils: 35 percent

Minor Components
Delpoint and similar soils: 0 to 4 percent
Marmarth and similar soils: 0 to 3 percent
Chinook and similar soils: 0 to 3 percent
Shallow soils with channers: 0 to 3 percent
Soils with flagstones: 0 to 2 percent

Major Component Description

Parshall
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.9 inches

Cohagen
Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 1.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Prego Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Relict stream terraces
Parent material: Alluvium
Slope range: 2 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Coarse-loamy, mixed Aridic Argiborolls

Typical Pedon

Prego sandy loam, 2 to 15 percent slopes, in an area of rangeland, 1,300 feet south and 1,400 feet west of the northeast corner of sec. 7, T. 1 N., R. 57 E.

A—0 to 5 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; few fine and many very fine roots; slightly acid; clear smooth boundary.

Bt1—5 to 10 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; few distinct clay bridges between mineral grains; neutral; clear smooth boundary.

Bt2—10 to 16 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; few faint clay films on faces of peds and clay bridges between mineral grains; neutral; abrupt smooth boundary.

2C—16 to 60 inches; light olive brown (2.5Y 5/4) sand; olive brown (2.5Y 4/4) moist; single grain; loose, nonsticky, nonplastic; 10 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 10 inches
Depth to the 2C horizon: 10 to 20 inches

A horizon
- Hue: 7.5YR, 10YR, or 2.5Y
- Value: 4 or 5 dry; 2 or 3 moist
- Chroma: 2 or 3
- Clay content: 8 to 14 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Reaction: pH 6.1 to 7.3

Bt horizons
- Hue: 7.5YR, 10YR, or 2.5Y
- Value: 4, 5, or 6 dry; 3, 4, or 5 moist
- Chroma: 2 to 4
- Texture: Sandy loam or fine sandy loam
- Clay content: 14 to 18
- Content of rock fragments: 0 to 15 percent pebbles
- Reaction: pH 6.1 to 7.3

2C horizon
- Hue: 10YR or 2.5Y
- Value: 4, 5, or 6 dry; 4 or 5 moist
- Chroma: 3 or 4
- Texture: Sand or loamy sand
- Clay content: 1 to 8 percent
- Content of rock fragments: 5 to 35 percent pebbles
- Reaction: pH 6.1 to 7.3

48D—Prego sandy loam, 2 to 15 percent slopes

Setting

Landform: Relict stream terraces
Slope: 2 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Prego and similar soils: 85 percent

Minor Components
Eapa and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent

Soils with gravelly surface layers: 0 to 2 percent
Soils with darker colored surface layers: 0 to 2 percent
Soils that have slopes more than 15 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Reeder Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated, loamy sedimentary beds
Slope range: 1 to 35 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Reeder loam, in an area of Belltower-Reeder-Vebar complex, 4 to 15 percent slopes, in an area of forestland, 1,700 feet north and 2,200 feet west of the southeast corner of sec. 34, T. 2 S., R. 61 E.

Oi—1 inch to 0; slightly decomposed forest litter.
A—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few medium and common very fine and fine roots; common very fine pores; neutral; clear smooth boundary.
Bt—8 to 19 inches; light brownish gray, (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; strong medium and coarse prismatic structure parting to strong fine and medium subangular blocky; hard, firm, moderately sticky, moderately plastic; few medium and common very fine and fine roots; common very fine and fine pores; few faint clay films on faces of peds and in pores; 15 percent soft coarse fragments; slightly alkaline; gradual wavy boundary.
Bk—19 to 31 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine pores; 20 percent soft coarse fragments; common fine seams and masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.
Cr—31 to 60 inches; white (2.5Y 8/0) semiconsolidated loamy sedimentary beds that crush to a loam, light gray (2.5Y 7/2) moist.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Bk horizon: 11 to 26 inches
Depth to the Cr horizon: 20 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 3, 4, or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 15 to 27 percent
Reaction: pH 6.1 to 7.3

Bt horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 2 to 4
Texture: Loam, sandy clay loam, or clay loam
Clay content: 18 to 35 percent
Reaction: pH 6.6 to 8.4

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, silt loam, silty clay loam, clay loam, or sandy clay loam
Clay content: 15 to 30 percent
Content of soft rock fragments: 35 to 60 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

42C—Reeder loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Reeder and similar soils: 85 percent

Minor Components
Cabba and similar soils: 0 to 4 percent
Very deep loamy soils: 0 to 3 percent
Moderately saline soils: 0 to 3 percent
Soils that are calcareous throughout: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

142D—Reeder-Cabba loams, 4 to 15 percent slopes

Setting

Landform:
- Reeder—Sedimentary plains and hills
- Cabba—Sedimentary plains and hills

Position on landform:
- Reeder—Backslopes and footslopes
- Cabba—Shoulders and summits

Slope:
- Reeder—4 to 15 percent
- Cabba—4 to 15 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Reeder and similar soils: 55 percent
Cabba and similar soils: 30 percent

Minor Components
Dast and similar soils: 0 to 4 percent
Very deep loamy soils: 0 to 4 percent
Very shallow loamy soils: 0 to 3 percent
Moderately saline soils: 0 to 2 percent
Soils that have slopes less than 4 percent: 0 to 2 percent

Major Component Description

Reeder
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.2 inches

Cabba
Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

242D—Reeder-Dast complex, 4 to 15 percent slopes

Setting

Landform:
- Reeder—Sedimentary plains and hills
- Dast—Sedimentary plains and hills

Position on landform:
- Reeder—Backslopes and shoulders
- Dast—Shoulders and summits

Slope:
- Reeder—4 to 15 percent
- Dast—4 to 15 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Reeder and similar soils: 45 percent
Dast and similar soils: 40 percent

Minor Components
Very deep loamy soils: 0 to 4 percent
Cabba and similar soils: 0 to 4 percent
Moderately deep clayey soils: 0 to 4 percent
Soils that have slopes less than 4 percent: 0 to 3 percent

Major Component Description

Reeder
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.2 inches

Dast
Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Rentsac Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Bedrock-floored plains and hills
Parent material: Hard sandstone
Slope range: 2 to 45 percent
Annual precipitation: 12 to 17 inches

Taxonomic Class: Loamy-skeletal, mixed (calcareous), frigid Lithic Ustic Torriorthents

Typical Pedon

Rentsac sandy loam, in an area of Rentsac-Twilight-Rock outcrop complex, 15 to 45 percent slopes, in an area of rangeland, 1,600 feet south and 1,500 feet west of the northeast corner of sec. 2, T. 1 S., R. 61 E.

A—0 to 4 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk—4 to 16 inches; brown (10YR 5/3) very channery sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine pores; 55 percent channers; common fine and medium masses of lime; common faint lime coats on undersides of channers; violently effervescent; moderately alkaline.

R—16 to 60 inches; hard sandstone.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the R horizon: 10 to 20 inches

A horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 2 to 4
Clay content: 7 to 18 percent
Content of rock fragments: 0 to 15 percent channers
Reaction: pH 6.6 to 8.4

Bk horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loam, sandy loam, or fine sandy loam
Clay content: 7 to 18 percent
Content of rock fragments: 35 to 70 percent pebbles, channers, and flagstones
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

99F—Rentsac-Twilight-Rock outcrop complex, 15 to 45 percent slopes

Setting

Landform:
- Rentsac—Hills
- Twilight—Hills
- Rock outcrop—Hills

Slope:
- Rentsac—15 to 45 percent
- Twilight—15 to 45 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Rentsac and similar soils: 35 percent
Twilight and similar soils: 30 percent
Rock outcrop: 20 percent

Minor Components
Cabbart and similar soils: 0 to 4 percent
Yamacall and similar soils: 0 to 4 percent
Blacksheep and similar soils: 0 to 4 percent
Very shallow loamy soils: 0 to 3 percent

Major Component Description

Rentsac
Surface layer texture: Sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.4 inches

Twilight
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Rock outcrop
Definition: Hard sandstone

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Ridge Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills
Parent material: Semiconsolidated, sandy sedimentary beds
Slope range: 8 to 65 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Loamy, mixed, frigid, shallow Typic Ustochrepts

Typical Pedon

Ridge sandy loam, in an area of Broadus-Ridge-Reeder complex, 8 to 25 percent slopes, in an area of forestland, 2,500 feet north and 1,500 feet west of the southeast corner of sec. 18, T. 8 S., R. 55 E.

Oi—1/2 inch to 0; slightly decomposed forest litter.
A—0 to 2 inches; brown (10YR 5/3) sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; loose, very friable, nonsticky, nonplastic; many fine roots; many very fine and fine pores; disseminated lime; slightly effervescent; slightly alkaline; clear smooth boundary.
Bw1—2 to 6 inches; pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, friable, nonsticky, nonplastic; many fine roots; few fine and many very fine pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.
Bw2—6 to 12 inches; pale brown (10YR 6/3) sandy loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; soft, friable, nonsticky, nonplastic; many fine roots; few fine and common very fine pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.
Bk—12 to 16 inches; light gray (2.5Y 7/2) sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, friable, nonsticky, nonplastic; common fine roots; few very fine masses and threads of lime;

violently effervescent; moderately alkaline; clear smooth boundary.
Cr—16 to 60 inches; light gray (2.5Y 7/2) semiconsolidated, sandy sedimentary beds that crush to loamy sand, grayish brown (2.5Y 5/2) moist; common fine roots in cracks; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 10 to 16 inches
Depth to the Cr horizon: 12 to 20 inches

A horizon
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 2 to 4
Clay content: 5 to 20 percent
Reaction: pH 7.4 to 7.8

Bw horizons
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Sandy loam or loam
Clay content: 5 to 20 percent
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 6 or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Sandy loam or loam
Clay content: 5 to 20 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

Cr horizon
Reaction: pH 7.4 to 8.4

13E—Rock outcrop

Setting

Landform: Escarpments
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Rock outcrop: 85 percent

Minor Components
Blacksheep and similar soils: 0 to 4 percent
Cabbart and similar soils: 0 to 4 percent
Very shallow loamy soils: 0 to 4 percent
Very shallow clayey soils: 0 to 3 percent

Major Component Description

Definition: Hard calcareous sandstone

177E—Rock outcrop-Moyerson complex, 15 to 50 percent slopes

Setting

Landform:
- Rock outcrop—Hills
- Moyerson—Hills

Slope:
- Moyerson—15 to 50 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Rock outcrop: 55 percent
Moyerson and similar soils: 30 percent

Minor Components
Very shallow clayey soils: 0 to 4 percent
Strongly saline soils: 0 to 4 percent
Neldore and similar soils: 0 to 4 percent
Yawdim and similar soils: 0 to 3 percent

Major Component Description

Rock outcrop
Definition: Consolidated sandstone and shale

Moyerson
Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: Mainly 1.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Ryell Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour) above the 2C3 horizon; rapid (6.0 to 20.0 inches/hour) in the 2C3 horizon
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Coarse-loamy over sandy or sandy skeletal, mixed (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Ryell fine sandy loam, in an area of Hanly-Ryell fine sandy loams, 0 to 4 percent slopes, in an area of rangeland, 1,600 feet south and 300 feet west of the northeast corner of sec. 26, T. 1 N., R. 60 E.

A—0 to 10 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine and many very fine roots; few very fine and fine pores; slightly alkaline; clear smooth boundary.
C1—10 to 21 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; loose, very friable, slightly sticky, slightly plastic; common very fine and fine roots; few very fine pores; 5 percent pebbles; few thin strata of sandy loam; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.
C2—21 to 31 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine pores; 5 percent pebbles; few thin strata of sandy loam; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.
2C3—31 to 60 inches; grayish brown (2.5Y 5/2) stratified very gravelly loamy sand and very gravelly sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky, nonplastic; few very fine roots; 40 percent pebbles and 10 percent cobbles; disseminated lime; slightly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the 2C3 horizon: 18 to 36 inches

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

C1 and C2 horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Very fine sandy loam, loamy very fine sand, or loam
Clay content: 10 to 18 percent
Content of rock fragments: 0 to 5 percent pebbles
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

2C3 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Sand or loamy sand
Clay content: 0 to 10 percent
Content of rock fragments: 35 to 70 percent—0 to 15 percent cobbles; 35 to 55 percent pebbles
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

Shambo Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans, sedimentary plains, and hills
Parent material: Alluvium
Slope range: 4 to 15 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Fine-loamy, mixed Typic Haploborolls

Typical Pedon

Shambo loam, in an area of Shambo-Mowbray-Parchin complex, 4 to 25 percent slopes, in an area of rangeland, 2,300 feet south and 2,300 feet east of the northwest corner of sec. 9, T. 3 S., R. 62 E.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine pores; neutral; clear smooth boundary.
Bw1—5 to 14 inches; dark brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure;

slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; few fine and common very fine pores; neutral; clear smooth boundary.

Bw2—14 to 23 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine and common very fine roots; common very fine pores and few fine pores; neutral; clear smooth boundary.

Bw3—23 to 30 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few very fine and fine roots; few very fine and fine pores; slightly alkaline; gradual wavy boundary.

Bk—30 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few very fine roots; few very fine pores; common fine masses and seams of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Bk horizon: 14 to 30 inches

A horizon
Value: 3, 4, or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 10 to 27 percent
Reaction: pH 6.6 to 7.8

Bw horizons
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3 or 4 moist
Chroma: 2 to 4
Texture: Loam, silt loam, or clay loam
Clay content: 18 to 35 percent
Reaction: pH 6.6 to 8.4

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, clay loam, silty clay loam, or silt loam
Clay content: 18 to 35 percent
Calcium carbonate equivalent: 10 to 15 percent
Reaction: pH 7.4 to 9.0

131C—Shambo-Noonan loams, 4 to 15 percent slopes

Setting

Landform:
- Shambo—Alluvial fans
- Noonan—Alluvial fans

Slope:
- Shambo—4 to 15 percent
- Noonan—4 to 15 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Shambo and similar soils: 45 percent
Noonan and similar soils: 40 percent

Minor Components
Deep moderately saline soils: 0 to 4 percent
Cabba and similar soils: 0 to 4 percent
Shallow cobbly soils: 0 to 4 percent
Shallow bouldery soils: 0 to 3 percent

Major Component Description

Shambo
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.9 inches

Noonan
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 9.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

231D—Shambo-Mowbray-Parchin complex, 4 to 25 percent slopes

Setting

Landform:
- Shambo—Sedimentary plains and hills
- Mowbray—Hills
- Parchin—Sedimentary plains

Slope:
- Shambo—4 to 15 percent
- Mowbray—15 to 25 percent
- Parchin—4 to 8 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Shambo and similar soils: 40 percent
Mowbray and similar soils: 25 percent
Parchin and similar soils: 20 percent

Minor Components
Cabba and similar soils: 0 to 4 percent
Reeder and similar soils: 0 to 4 percent
Vebar and similar soils: 0 to 3 percent
Very shallow sandy soils: 0 to 2 percent
Areas of slickspots: 0 to 2 percent

Major Component Description

Shambo
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.9 inches

Mowbray
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

Parchin
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tanna Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated shale
Slope range: 2 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Tanna silty clay loam, 2 to 8 percent slopes, in an area of rangeland, 500 feet north and 500 feet west of the southeast corner of sec. 20, T. 9 S., R. 61 E.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, friable, slightly sticky, plastic; many very fine and fine roots; slightly alkaline; abrupt smooth boundary.

A2—2 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; many very fine and fine roots; many very fine pores; slightly alkaline; clear smooth boundary.

Bt—7 to 19 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to strong medium subangular blocky; very hard, firm, moderately sticky, moderately plastic; few fine and many very fine roots; common very fine pores; many distinct clay films on faces of peds and in pores; slightly alkaline; gradual smooth boundary.

Bk—19 to 27 inches; pale brown (10YR 6/3) clay, brown (10YR 4/3) moist; massive; hard, friable, moderately sticky, moderately plastic; few very

fine roots; few very fine pores; many medium and common fine masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—27 to 60 inches; light brownish gray (10YR 6/2) semiconsolidated shale that crushes to clay loam, dark grayish brown (10YR 4/2) moist.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Thickness of the mollic epipedon: 7 to 12 inches
*Depth to the Bk horiz*on: 10 to 20 inches
Depth to bedrock: 20 to 40 inches

A horizons
- Hue: 10YR or 2.5Y
- Value: 2 or 3 moist
- Chroma: 2 or 3
- Clay content: 27 to 35 percent
- Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent channers
- Reaction: pH 6.6 to 7.8

Bt horizon
- Hue: 10YR or 2.5Y
- Value: 3 or 4 moist
- Chroma: 2 or 3
- Texture: Clay loam, silty clay loam, clay, or silty clay
- Clay content: 35 to 50 percent
- Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent channers
- Electrical conductivity: 0 to 4 mmhos/cm
- Reaction: pH 6.6 to 8.4

Bk horizon
- Hue: 10YR or 2.5Y
- Value: 5 or 6 dry; 4 or 5 moist
- Chroma: 2 or 3
- Texture: Clay loam, silty clay loam, or clay
- Clay content: 35 to 50 percent
- Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent channers
- Electrical conductivity: 2 to 4 mmhos/cm
- Calcium carbonate equivalent: 5 to 15 percent
- Reaction: pH 7.4 to 8.4

Cr horizon
- Material: Semiconsolidated shale with thin layers of hard sandstone that are rippable

64C—Tanna silty clay loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Tanna and similar soils: 85 percent

Minor Components
Cabbart and similar soils: 0 to 3 percent
Eapa and similar soils: 0 to 3 percent
Weingart and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

164C—Tanna-Ethridge silty clay loams, 2 to 8 percent slopes

Setting

Landform:
- Tanna—Sedimentary plains
- Ethridge—Alluvial fans

Slope:
- Tanna—2 to 8 percent
- Ethridge—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Tanna and similar soils: 50 percent
Ethridge and similar soils: 35 percent

Minor Components
Eapa and similar soils: 0 to 3 percent
Weingart and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 2 percent
Soils with sandy loam surface layers: 0 to 2 percent
Soils that have slopes less than 2 percent: 0 to 2 percent

Major Component Description

Tanna
Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.4 inches

Ethridge
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

164D—Tanna-Ethridge silty clay loams, 8 to 15 percent slopes

Setting

Landform:
- Tanna—Hills
- Ethridge—Alluvial fans

Slope:
- Tanna—8 to 15 percent
- Ethridge—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Tanna and similar soils: 55 percent
Ethridge and similar soils: 30 percent

Minor Components
Weingart and similar soils: 0 to 4 percent
Cabbart and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Soils with sandy loam surface layers: 0 to 3 percent
Soils that have slopes more than 15 percent: 0 to 2 percent

Major Component Description

Tanna
Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.4 inches

Ethridge
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Teigen Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic, frigid Aridic Ustochrepts

Typical Pedon

Teigen silty clay loam, 0 to 4 percent slopes, in an area of rangeland, 1,340 feet north and 240 feet east of the southwest corner of sec. 24, T. 9 S., R. 58 E.

A—0 to 3 inches; light brownish gray (10YR 6/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate thick platy structure; slightly hard, firm, moderately sticky, moderately plastic; few very fine and fine roots; few very fine pores; moderately acid; clear smooth boundary.

Bw1—3 to 15 inches; light brownish gray (10YR 6/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; common very fine pores; moderately acid; gradual smooth boundary.

Bw2—15 to 24 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; few very fine pores; 5 percent soft shale channers; moderately acid; gradual wavy boundary.

BC—24 to 28 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, moderately sticky, moderately plastic; few very fine roots; few very fine pores; 5 percent pebbles and 10 percent soft shale channers; slightly acid; gradual wavy boundary.

C—28 to 60 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, moderately sticky, moderately plastic; 5 percent soft shale channers; moderately acid.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Soil phases: Gullied

A horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 1 or 2
Texture: Silty clay loam or clay loam
Clay content: 30 to 40 percent
Content of rock fragments: 0 to 10 percent shale fragments—0 to 5 percent soft shale; 0 to 5 percent hard shale
Reaction: pH 4.5 to 6.0

Bw horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, or 6 dry; 3 or 4 moist
Chroma: 1 or 2
Texture: Clay loam, silty clay loam, or silty clay
Clay content: 35 to 55 percent
Content of rock fragments: 0 to 10 percent shale fragments—0 to 5 percent soft shale; 0 to 5 percent hard shale
Reaction: pH 4.5 to 6.5

BC and C horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, or 6 dry; 3 or 4 moist
Chroma: 1 or 2
Texture: Loam, silt loam, clay loam, silty clay loam, or silty clay
Clay content: 35 to 55 percent
Content of rock fragments: 5 to 15 percent shale fragments—5 to 10 percent soft shale; 0 to 5 percent hard shale
Reaction: pH 4.5 to 6.5

95A—Teigen silty clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Teigen and similar soils: 85 percent

Minor Components
Vaeda and similar soils: 0 to 4 percent
Creed and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Soils that have slopes more than 4 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

95D—Teigen clay loam, gullied, 4 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Teigen and similar soils: 85 percent

Minor Components
Vaeda and similar soils: 0 to 4 percent
Neldore and similar soils: 0 to 4 percent
Soils that are calcareous throughout: 0 to 4 percent
Weingart and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tricart Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Relict stream terraces
Parent material: Alluvium
Slope range: 4 to 45 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Loamy-skeletal, mixed Aridic Calciborolls

Typical Pedon

Tricart clay loam, 4 to 15 percent slopes, in an area of rangeland, 2,500 feet north and 500 feet east of the southwest corner of sec. 11, T. 5 S., R. 59 E.

A1—0 to 1 inch; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; common fine and many very fine roots; common very fine pores; neutral; clear smooth boundary.

A2—1 to 6 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; few fine and common very fine roots; few very fine pores; 5 percent pebbles; slightly alkaline; clear wavy boundary.

Bk1—6 to 13 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky, moderately plastic; common very fine roots; few very fine pores; 10 percent pebbles; common fine and medium masses of lime; strongly effervescent; slightly alkaline; gradual wavy boundary.

2Bk2—13 to 25 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots; few very fine pores; 40 percent pebbles; common distinct lime coats on surfaces of pebbles; many fine and medium masses of lime; violently effervescent; moderately alkaline, gradual wavy boundary.

2Bk3—25 to 60 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots; 55 percent pebbles; common distinct lime coats on surfaces of pebbles; many fine and medium masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 10 inches

A1 horizon
- Hue: 10YR or 2.5Y
- Chroma: 2 or 3
- Texture: Loam or clay loam when mixed to 7 inches
- Clay content: 15 to 35 percent
- Content of rock fragments: 0 to 35 percent pebbles
- Reaction: pH 6.6 to 8.4

A2 horizon
- Hue: 10YR or 2.5Y
- Chroma: 2 or 3
- Texture: Loam or clay loam
- Clay content: 15 to 35 percent
- Content of rock fragments: 0 to 35 percent pebbles
- Reaction: pH 6.6 to 8.4

Bk1 horizon
- Hue: 10YR or 2.5Y
- Value: 6 or 7 dry; 4, 5, or 6 moist
- Chroma: 2 or 3
- Texture: Sandy loam, loam, or clay loam
- Clay content: 15 to 35 percent
- Content of rock fragments: 10 to 35 percent pebbles
- Calcium carbonate equivalent: 10 to 30 percent
- Reaction: pH 7.4 to 8.4

2Bk horizons
- Hue: 10YR or 2.5Y
- Value: 6 or 7 dry; 5 or 6 moist
- Chroma: 2 or 3
- Texture: Loam or sandy loam
- Clay content: 5 to 15 percent
- Content of rock fragments: 35 to 60 percent pebbles
- Calcium carbonate equivalent: 15 to 30 percent
- Reaction: pH 7.4 to 8.4

23D—Tricart clay loam, 4 to 15 percent slopes

Setting

Landform: Relict stream terraces
Slope: 4 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Tricart and similar soils: 85 percent

Minor Components
Yamacall and similar soils: 0 to 4 percent
Soils with gravelly surfaces: 0 to 4 percent
Delpoint and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 2 percent
Soils that have slopes more than 15 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

23E—Tricart gravelly loam, 15 to 45 percent slopes

Setting

Landform: Relict stream terraces
Slope: 15 to 45 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Tricart and similar soils: 85 percent

Minor Components
Delpoint and similar soils: 0 to 4 percent
Soils with very gravelly surfaces: 0 to 4 percent
Soils with darker colored surface layers: 0 to 4 percent
Soils that have slopes less than 15 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Twilight Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated, sandy sedimentary beds
Slope range: 2 to 45 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Coarse-loamy, mixed, frigid Aridic Ustochrepts

Typical Pedon

Twilight fine sandy loam, in an area of Blacksheep-Twilight fine sandy loams, 8 to 15 percent slopes, in an area of rangeland, 1,000 feet north and 2,700 feet east of the southwest corner of sec. 18, T. 2 S., R. 56 E.

A—0 to 3 inches; dark grayish brown (2.5Y 4/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky, nonplastic; few medium and common very fine roots; neutral; clear smooth boundary.

Bw1—3 to 12 inches; light olive brown (2.5Y 5/4) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable, nonsticky, nonplastic; few fine and common very fine roots; few very fine and fine pores; slightly alkaline; clear wavy boundary.

Bw2—12 to 18 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, nonsticky, nonplastic; common very fine roots; few very fine pores; slightly alkaline; clear wavy boundary.

Bk—18 to 30 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine pores; few fine and medium masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—30 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated, sandy sedimentary beds that crush to fine sandy loam, grayish brown (2.5Y 5/2) moist.

Range in Characteristics

Depth to the Bk horizon: 10 to 20 inches
Depth to the Cr horizon: 20 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 5 to 18 percent
Reaction: pH 6.6 to 7.8

Bw horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Fine sandy loam or sandy loam
Clay content: 5 to 18 percent
Reaction: pH 6.6 to 7.8

Bk horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 1 to 4
Texture: Fine sandy loam or sandy loam
Clay content: 5 to 18 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

69C—Twilight fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Twilight and similar soils: 85 percent

Minor Components
Bonfri and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 3 percent
Yamacall and similar soils: 0 to 2 percent
Delpoint and similar soils: 0 to 2 percent
Chinook and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

69D—Twilight fine sandy loam, 8 to 15 percent slopes

Setting

Landform: Hills
Slope: 8 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Twilight and similar soils: 85 percent

Minor Components
Blacksheep and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Chinook and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

269C—Twilight-Bonfri complex, 2 to 8 percent slopes

Setting

Landform:
- Twilight—Sedimentary plains
- Bonfri—Sedimentary plains

Position on landform:
- Twilight—Shoulders and summits
- Bonfri—Backslopes and shoulders

Slope:
- Twilight—2 to 8 percent
- Bonfri—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Twilight and similar soils: 55 percent
Bonfri and similar soils: 30 percent

Minor Components
Blacksheep and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Weingart and similar soils: 0 to 2 percent
Cabbart and similar soils: 0 to 2 percent
Chinook and similar soils: 0 to 2 percent

Major Component Description

Twilight
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Bonfri
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

269D—Twilight-Bonfri complex, 8 to 15 percent slopes

Setting

Landform:
- Twilight—Hills
- Bonfri—Hills

Position on landform:
- Twilight—Shoulders and summits
- Bonfri—Backslopes and shoulders

Slope:
- Twilight—8 to 15 percent
- Bonfri—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Twilight and similar soils: 55 percent
Bonfri and similar soils: 30 percent

Minor Components
Blacksheep and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Yamacall and similar soils: 0 to 2 percent
Weingart and similar soils: 0 to 2 percent
Chinook and similar soils: 0 to 2 percent

Major Component Description

Twilight
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Bonfri
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

369C—Twilight-Delpoint complex, 2 to 8 percent slopes

Setting

Landform:
- Twilight—Sedimentary plains
- Delpoint—Sedimentary plains

Position on landform:
- Twilight—Shoulders and summits
- Delpoint—Backslopes and shoulders

Slope:
- Twilight—2 to 8 percent
- Delpoint—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Twilight and similar soils: 50 percent
Delpoint and similar soils: 35 percent

Minor Components
Blacksheep and similar soils: 0 to 4 percent
Bonfri and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Soils with darker colored surface layers: 0 to 2 percent

Major Component Description

Twilight
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Delpoint
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

369D—Twilight-Cabbart complex, 8 to 15 percent slopes

Setting

Landform:
- Twilight—Hills
- Cabbart—Hills

Position on landform:
- Twilight—Backslopes and footslopes
- Cabbart—Shoulders and summits

Slope:
- Twilight—8 to 15 percent
- Cabbart—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Twilight and similar soils: 50 percent
Cabbart and similar soils: 35 percent

Minor Components
Blacksheep and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Weingart and similar soils: 0 to 2 percent
Cambeth and similar soils: 0 to 2 percent
Soils with darker colored surface layers: 0 to 2 percent

Major Component Description

Twilight
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Cabbart
Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Ustochrepts

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour) to moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills (slump area)
Parent material: Semiconsolidated, loamy sedimentary beds
Slope range: 15 to 45 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Aridic Ustochrepts

Typical Pedon

Ustochrepts, in an area of Ustochrepts-Haploborolls complex, slump, 15 to 45 percent slopes, in an area of rangeland, 2,500 feet north and 500 feet west of the southeast corner of sec. 7, T. 4 S., R. 60 E.

A—0 to 5 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few medium and common very fine and fine roots; disseminated lime; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bw—5 to 12 inches; light brownish gray (10YR 6/2) channery loam, dark grayish brown (10YR 4/2) moist; strong medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium and many very fine and fine roots; few fine and many very fine pores; 15 percent channers and 5 percent flagstones; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—12 to 20 inches; light yellowish brown (2.5Y 6/4) very channery loam, olive brown (2.5Y 4/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium and many very fine roots; common fine and many very fine pores; 30 percent channers and 5 percent flagstones; few fine masses and seams of lime; violently effervescent; strongly alkaline; clear smooth boundary.

Bk2—20 to 37 inches; light yellowish brown (2.5Y 6/4) very channery loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few medium and common very fine and fine roots; 35 percent channers and 5 percent flagstones; few fine masses of lime; violently effervescent; strongly alkaline; clear wavy boundary.

Cr—37 to 60 inches; semiconsolidated, loamy sedimentary beds.

Range in Characteristics

Content of soft coarse fragments in the control section: 0 to 80 percent

Content of rock fragments in the control section: 35 to 60 percent channers or flagstones

Depth to calcium carbonate: 0 to 10 inches

Other features: Soft coarse fragments increase with depth.

A horizon
- Clay content: 12 to 27 percent
- Content of rock fragments: 0 to 10 percent flagstones and channers
- Electrical conductivity: 2 to 16 mmhos/cm
- Sodium adsorption ratio: 0 to 30
- Reaction: pH 7.4 to 9.0

Bw horizon
- Clay content: 12 to 27 percent
- Content of rock fragments: 10 to 35 percent—10 to 35 percent channers; 0 to 5 percent flagstones
- Electrical conductivity: 2 to 16 mmhos/cm
- Sodium adsorption ratio: 0 to 30
- Reaction: pH 7.4 to 9.0

Bk horizons
- Clay content: 12 to 35 percent
- Content of rock fragments: 35 to 60 percent—35 to 60 percent channers; 0 to 10 percent flagstones
- Electrical conductivity: 2 to 16 mmhos/cm
- Sodium adsorption ratio: 0 to 30
- Calcium carbonate equivalent: 5 to 15 percent
- Reaction: pH 7.4 to 9.0

17E—Ustochrepts-Haploborolls complex, slump, 15 to 45 percent slopes

Setting

Landform:
- Ustochrepts—Hills
- Haploborolls—Hills

Slope:
- Ustochrepts—15 to 45 percent
- Haploborolls—15 to 45 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components

Ustochrepts and similar soils: 45 percent

Haploborolls and similar soils: 40 percent

Minor Components

Yawdim and similar soils: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Areas of gullied land: 0 to 3 percent

Areas with ponderosa pines: 0 to 3 percent

Soils that have slopes less than 15 percent: 0 to 1 percent

Very poorly drained soils: 0 to 1 percent

Major Component Description

Ustochrepts

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches

Haploborolls
Surface layer texture: Channery fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Vaeda Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic, nonacid, frigid Aridic Ustochrepts

Typical Pedon

Vaeda silty clay loam, 0 to 2 percent slopes, in an area of rangeland, 2,400 feet south and 1,900 feet east of the northwest corner of sec. 8, T. 9 S., R. 61 E.

E—0 to 2 inches; light gray (10YR 7/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; soft, very friable, very sticky, moderately plastic; few very fine and fine roots; common very fine and fine pores; neutral; gradual wavy boundary.

Bw—2 to 8 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; hard, friable, very sticky, moderately plastic; few very fine and fine roots; common very fine pores; neutral; clear smooth boundary.

By1—8 to 24 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; moderate fine and medium subangular blocky structure; hard, friable, very sticky, moderately plastic; few very fine and fine roots; common very fine pores; common fine nests and seams of gypsum crystals; slightly alkaline; gradual wavy boundary.

By2—24 to 60 inches; light brownish gray (10YR 6/2) silty clay loam, dark gray (10YR 4/1) moist; moderate fine and medium subangular blocky structure; hard, firm, very sticky, moderately plastic; few very fine and fine roots; common very fine pores; few fine seams and nests of gypsum crystals; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the By horizon: 6 to 15 inches

E and Bw horizons
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5, 6, or 7 dry; 4, 5, or 6 moist
- Chroma: 2 or 3
- Clay content: 35 to 40 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Electrical conductivity: 2 to 4 mmhos/cm
- Sodium adsorption ratio: 0 to 5
- Reaction: pH 5.6 to 7.8

By1 horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5 or 6 dry; 4 or 5 moist
- Chroma: 2 or 3
- Texture: Silty clay loam, silty clay, or clay
- Clay content: 35 to 60 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Electrical conductivity: 4 to 16 mmhos/cm
- Sodium adsorption ratio: 10 to 20
- Gypsum content: 1 to 5 percent
- Reaction: pH 6.1 to 7.8

By2 horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5 or 6 dry; 4 or 5 moist
- Chroma: 1 to 3
- Texture: Silty clay loam, silty clay, or clay
- Clay content: 35 to 60 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Electrical conductivity: 4 to 16 mmhos/cm
- Sodium adsorption ratio: 10 to 20
- Gypsum content: 1 to 5 percent
- Reaction: pH 6.1 to 8.4

96A—Vaeda silty clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Vaeda and similar soils: 85 percent

Minor Components
Vanda and similar soils: 0 to 4 percent
Bickerdyke and similar soils: 0 to 3 percent
Absher and similar soils: 0 to 3 percent
Gerdrum and similar soils: 0 to 3 percent
Soils that have slopes more than 2 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

196C—Vaeda-Creed complex, 0 to 4 percent slopes

Setting

Landform:
- Vaeda—Alluvial fans
- Creed—Alluvial fans

Slope:
- Vaeda—0 to 4 percent
- Creed—0 to 4 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Vaeda and similar soils: 70 percent
Creed and similar soils: 20 percent

Minor Components
Bickerdyke and similar soils: 0 to 3 percent
Vanda and similar soils: 0 to 3 percent
Gerdrum and similar soils: 0 to 2 percent
Soils that have slopes more than 4 percent: 0 to 2 percent

Major Component Description

Vaeda
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 inches

Creed
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Vanda Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents

Typical Pedon

Vanda silty clay loam, 0 to 2 percent slopes, in an area of rangeland, 1,200 feet south and 600 feet east of the northwest corner of sec. 2, T. 8 S., R. 60 E.

A—0 to 3 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate fine granular structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Byz1—3 to 17 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common very fine pores; common seams and nests of gypsum crystals; few fine seams and nests of other salts; disseminated lime; strongly effervescent; strongly alkaline; clear smooth boundary.

Byz2—17 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 4/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; few very fine roots; few very fine pores; few fine seams and nests of gypsum crystals; few fine seams of other salts; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Soil phases: Warm
Taxonomic note: Map unit 613B is a taxadjunct to the Vanda series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Clay or silty clay loam
Clay content: 30 to 60 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 20 to 30
Reaction: pH 7.8 to 9.6

Byz horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay, silty clay, or silty clay loam
Clay content: 35 to 60 percent
Gypsum content: 1 to 5 percent with total gypsum less than 150
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 30
Gypsum content: 1 to 5 percent
Reaction: pH 7.8 to 9.6

97A—Vanda silty clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Vanda and similar soils: 85 percent

Minor Components
Vaeda and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 4 percent
Absher and similar soils: 0 to 4 percent
Kobase and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

197A—Vanda-Marvan complex, 0 to 2 percent slopes

Setting

Landform:
- Vanda—Alluvial fans and stream terraces
- Marvan—Alluvial fans and stream terraces

Slope:
- Vanda—0 to 2 percent
- Marvan—0 to 2 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Vanda and similar soils: 45 percent
Marvan and similar soils: 40 percent

Minor Components
Absher and similar soils: 0 to 4 percent
Vaeda and similar soils: 0 to 4 percent
Gerdrum and similar soils: 0 to 4 percent
Kobase and similar soils: 0 to 3 percent

Major Component Description

Vanda
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

Marvan
Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

197C—Vanda-Marvan complex, 2 to 8 percent slopes

Setting

Landform:
- Vanda—Alluvial fans and stream terraces
- Marvan—Alluvial fans and stream terraces

Slope:
- Vanda—2 to 8 percent
- Marvan—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Vanda and similar soils: 45 percent
Marvan and similar soils: 40 percent

Minor Components
Absher and similar soils: 0 to 4 percent
Vaeda and similar soils: 0 to 4 percent
Gerdrum and similar soils: 0 to 4 percent
Kobase and similar soils: 0 to 3 percent

Major Component Description

Vanda
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

Marvan
Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Varney Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Varney loam, 2 to 8 percent slopes, in an area of rangeland, 1,200 feet south and 400 feet west of the northeast corner of sec. 4, T. 2 S., R. 57 E.

A—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; few fine and medium and many very fine roots; neutral; clear smooth boundary.

Bt1—4 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; hard, very friable, moderately sticky, moderately plastic; few fine and common very fine roots; many very fine pores; common faint clay films on faces of peds and in pores; neutral; clear smooth boundary.

Bt2—9 to 17 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, slightly plastic; few fine and common very fine roots; few fine and many very fine pores; common faint clay films on faces of peds, common distinct clay films in pores; slightly alkaline; clear wavy boundary.

Bk1—17 to 28 inches; pale brown (10YR 6/3) gravelly clay loam, grayish brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine pores; 15 percent pebbles; many fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—28 to 36 inches; pale brown (10YR 6/3) gravelly sandy loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; 25 percent pebbles; common distinct lime coats on undersides of rock fragments; common fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—36 to 60 inches; very pale brown (10YR 7/3) gravelly sandy loam, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; soft, friable, nonsticky, nonplastic; few very fine roots; 30 percent pebbles; common distinct lime coats on rock fragments; common fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Bk horizon: 9 to 20 inches

A horizon
- Hue: 10YR or 2.5Y
- Value: 4 or 5 dry; 2 or 3 moist
- Chroma: 2 or 3
- Clay content: 18 to 27 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Electrical conductivity: 0 to 2 mmhos/cm
- Reaction: pH 6.6 to 7.3

Bt horizons
- Hue: 10YR or 2.5Y
- Value: 4, 5, or 6 dry; 3, 4, or 5 moist
- Chroma: 2 to 4
- Texture: Clay loam or sandy clay loam
- Clay content: 27 to 35 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Electrical conductivity: 0 to 2 mmhos/cm
- Reaction: pH 6.6 to 7.8

Bk1 horizon
- Hue: 10YR or 2.5Y
- Value: 5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist
- Chroma: 2 to 4
- Texture: Sandy loam, loam, clay loam, or sandy clay loam
- Clay content: 10 to 30 percent
- Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles
- Calcium carbonate equivalent: 15 to 30 percent
- Electrical conductivity: 0 to 2 mmhos/cm
- Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizons
- Hue: 10YR or 2.5Y
- Value: 6, 7, or 8 dry; 4, 5, 6, or 7 moist
- Chroma: 3 or 4
- Texture: Sandy loam, loam, or sandy clay loam
- Clay content: 10 to 30 percent
- Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles
- Calcium carbonate equivalent: 15 to 30 percent
- Electrical conductivity: 0 to 2 mmhos/cm
- Reaction: pH 7.4 to 8.4

22A—Varney loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Varney and similar soils: 85 percent

Minor Components
Gerdrum and similar soils: 0 to 3 percent
Soils with very gravelly substratums: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 2 percent
Soils with cobbly surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

22C—Varney loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Varney and similar soils: 85 percent

Minor Components
Gerdrum and similar soils: 0 to 3 percent
Soils with very gravelly substratums: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 2 percent
Soils with cobbly surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

122C—Varney-Gerdrum complex, 2 to 8 percent slopes

Setting

Landform:
- Varney—Alluvial fans and stream terraces
- Gerdrum—Alluvial fans and stream terraces

Position on landform:
- Varney—Backslopes and footslopes
- Gerdrum—Microlows

Slope:
- Varney—2 to 8 percent
- Gerdrum—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Varney and similar soils: 50 percent
Gerdrum and similar soils: 35 percent

Minor Components
Gerdrum and similar soils: 0 to 3 percent
Soils with very gravelly substratums: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Soils with gravelly surface layers: 0 to 2 percent
Areas of slickspots: 0 to 1 percent

Major Component Description

Varney
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.6 inches

Gerdrum
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Vebar Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated, sandy sedimentary beds
Slope range: 4 to 50 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Coarse-loamy, mixed Typic Haploborolls

Typical Pedon

Vebar fine sandy loam, in an area of Belltower-Reeder-Vebar complex, 4 to 15 percent slopes, in an area of forestland, 500 feet south and 2,000 feet east of the northwest corner of sec. 4, T. 3 S., R. 61 E.

Oi—1 inch to 0; slightly decomposed forest litter.
A—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine, medium, and coarse and many very fine roots; few very fine pores; slightly acid; clear smooth boundary.
Bw—6 to 15 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine, fine, medium, and coarse roots; few very fine pores; slightly acid; clear wavy boundary.
Bk1—15 to 21 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; few very fine pores; few fine masses and threads of lime; 5 percent soft channers; strongly effervescent; moderately alkaline; gradual wavy boundary.
Bk2—21 to 31 inches; white (2.5Y 8/2) sandy loam, light brownish gray (2.5Y 6/2) moist; massive; slightly hard, friable, nonsticky, nonplastic; few very fine roots; common fine masses of lime and few medium masses of lime; 25 percent soft channers; violently effervescent; moderately alkaline; clear wavy boundary.
Cr—31 to 60 inches; white (2.5Y 8/2) semiconsolidated, sandy sedimentary beds that crush to very fine sandy loam, light gray (2.5Y 7/2) moist.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Bk horizon: 10 to 16 inches
Depth to the Cr horizon: 20 to 40 inches

A horizon
Value: 3, 4, or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 10 to 18 percent
Reaction: pH 6.1 to 7.8

Bw horizon
Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3 or 4 moist
Chroma: 2 to 4
Texture: Fine sandy loam or sandy loam
Clay content: 10 to 18 percent
Reaction: pH 6.1 to 8.4

Bk horizons
Hue: 10YR or 2.5Y
Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Fine sandy loam or sandy loam
Clay content: 7 to 15 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

Volborg Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated shale
Slope range: 2 to 60 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Clayey, montmorillonitic, acid, frigid, shallow Aridic Ustorthents

Typical Pedon

Volborg clay, in an area of Neldore-Volborg clays, 4 to 15 percent slopes, in an area of rangeland, 2,000 feet north and 2,700 feet east of the southwest corner of sec. 3, T. 6 S., R. 59 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (10YR 4/2) moist; weak coarse granular structure; very hard, friable, very sticky, very plastic; few fine and common very fine roots; slightly acid; abrupt smooth boundary.
C1—3 to 10 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure parting to moderate fine granular; very hard, friable, very sticky, very plastic; few fine and common very fine roots; few very fine pores; very strongly acid; clear wavy boundary.
C2—10 to 16 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure parting to moderate medium granular; extremely hard, firm, very sticky, very plastic; few very fine roots; very strongly acid; clear wavy boundary.
Cr—16 to 60 inches; light gray (2.5Y 7/0) semiconsolidated shale, gray (2.5Y 5/0) moist.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Depth to bedrock: 10 to 20 inches; saline phase: 10 to 14 inches
Soil phases: Saline or warm
Taxonomic note: Map unit 634E is a taxadjunct to the Volborg series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Silty clay or clay
Clay content: 40 to 50 percent
Electrical conductivity: 0 to 4 mmhos/cm
Sodium adsorption ratio: 0 to 5; saline phase: 5 to 13
Reaction: pH 4.5 to 6.5

C horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Silty clay loam, silty clay, or clay
Clay content: 35 to 50 percent
Electrical conductivity: 2 to 8 mmhos/cm; saline phase: 8 to 16 mmhos/cm
Sodium adsorption ratio: 0 to 13
Reaction: pH 3.6 to 5.5

Cr horizon
Material: Semiconsolidated shale
Electrical conductivity: 8 to 16 mmhos/cm
Reaction: pH 3.6 to 5.5

98C—Volborg clay, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Volborg and similar soils: 85 percent

Minor Components
Julin and similar soils: 0 to 4 percent
Neldore and similar soils: 0 to 4 percent
Very shallow clayey soils: 0 to 4 percent
Moderately saline soils: 0 to 3 percent

Major Component Description

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

198D—Volborg silty clay, saline, 4 to 15 percent slopes

Setting

Landform: Sedimentary plains and hills
Slope: 4 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Volborg and similar soils: 85 percent

Minor Components
Neldore and similar soils: 0 to 4 percent
Soils that are calcareous throughout: 0 to 4 percent
Very shallow clayey soils: 0 to 4 percent
Bascovy and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: Mainly 1.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

298E—Volborg-Julin-Rock outcrop complex, 8 to 25 percent slopes

Setting

Landform:
- Volborg—Hills
- Julin—Hills
- Rock outcrop—Hills

Slope:
- Volborg—8 to 25 percent
- Julin—8 to 25 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Volborg and similar soils: 40 percent
Julin and similar soils: 35 percent
Rock outcrop: 15 percent

Minor Components
Teigen and similar soils: 0 to 3 percent
Neldore and similar soils: 0 to 2 percent
Weingart and similar soils: 0 to 2 percent
Marvan and similar soils: 0 to 2 percent
Orinoco and similar soils: 0 to 1 percent

Major Component Description

Volborg
Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

Julin
Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.8 inches

Rock outcrop
Definition: Consolidated acid shale

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

398E—Volborg-Volborg, saline-Rock outcrop complex, 8 to 45 percent slopes

Setting

Landform:
- Volborg—Hills
- Volborg—Hills
- Rock outcrop—Hills

Slope:
- Volborg—8 to 45 percent
- Volborg—8 to 45 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Volborg and similar soils: 30 percent
Volborg and similar soils: 25 percent
Rock outcrop: 20 percent

Minor Components
Orinoco and similar soils: 0 to 4 percent
Neldore and similar soils: 0 to 4 percent
Very shallow clayey soils: 0 to 4 percent
Soils that are calcareous throughout: 0 to 3 percent

Major Component Description

Volborg
Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

Volborg
Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: Mainly 1.4 inches

Rock outcrop
Definition: Consolidated acid shale

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

634E—Volborg-Julin complex, warm, 6 to 60 percent slopes

Setting

Landform:
- Volborg—Sedimentary plains and hills
- Julin—Sedimentary plains and hills

Slope:
- Volborg—6 to 60 percent
- Julin—6 to 25 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Volborg and similar soils: 50 percent
Julin and similar soils: 35 percent

Minor Components
Very shallow clayey soils: 0 to 3 percent
Marvan and similar soils: 0 to 3 percent
Neldore and similar soils: 0 to 3 percent
Areas of shale outcroppings: 0 to 3 percent
Bascovy and similar soils: 0 to 2 percent
Soils that have slopes less than 6 percent: 0 to 1 percent

Major Component Description

Volborg
Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

Julin
Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

W—Water

Composition

Major Components
Water: 100 percent

Major Component Description

Definition: Areas of open water

Weingart Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated shale
Slope range: 0 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Weingart silty clay, 2 to 8 percent slopes, in an area of rangeland, 1,200 feet south and 1,200 feet west of the northeast corner of sec. 17, T. 8 S., R. 62 E.

E—0 to 2 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; slightly hard, friable, moderately sticky, moderately plastic; many very fine roots; few fine and common very fine pores; neutral; clear smooth boundary.

Btn—2 to 12 inches; pale brown (10YR 6/3) silty clay, brown (10YR 4/3) moist; moderate medium and coarse columnar structure parting to strong fine and medium subangular blocky; extremely hard, firm, moderately sticky, moderately plastic; many very fine roots; few very fine pores; many distinct clay films on faces of peds and in pores; moderately alkaline; clear smooth boundary.

Bkn—12 to 22 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, moderately sticky, moderately plastic; common very fine roots; common fine masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bnyz—22 to 30 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; moderate fine and medium subangular blocky structure; slightly hard, firm, moderately sticky, moderately plastic; few very fine roots; few very fine pores; many fine and medium nests and seams of gypsum crystals and other salts; moderately alkaline, clear smooth boundary.

Byz—30 to 36 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable, moderately sticky, moderately plastic; few very fine roots; few very fine pores; 55 percent soft shale fragments and 5 percent channers; few fine nests and seams of gypsum and other salts; moderately alkaline; clear smooth boundary.

Cr—36 to 60 inches; very pale brown (10YR 7/3) semiconsolidated shale, grayish brown (10YR 5/3) moist.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bkn horizon: 10 to 16 inches
Depth to the Bnyz horizon: 16 to 24 inches
Depth to the Cr horizon: 20 to 40 inches
Soil phases: Warm
Other features: Some pedons are calcareous above 10 inches. When the sodium adsorption ratio is less than 13, there is more exchangeable magnesium plus sodium then calcium plus exchange acidity.
Taxonomic note: Map unit 620C is a taxadjunct to the Weingart series in order to join soils that have an average soil temperature greater than 47 degrees F.

E horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist
Chroma: 2 or 3
Texture: Clay, clay loam, or silty clay when mixed to 7 inches
Clay content: 27 to 40 percent
Content of rock fragments: 0 to 10 percent—0 to 10 percent stones and cobbles; 0 to 5 percent hard shale; 0 to 5 percent soft shale
Reaction: pH 5.6 to 7.8

Btn horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4
Texture: Clay, silty clay, or sandy clay
Clay content: 40 to 60 percent
Content of rock fragments: 0 to 10 percent—0 to 5 percent hard shale; 0 to 5 percent soft shale
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 10 to 30
Reaction: pH 6.6 to 9.0

Bkn horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay loam, silty clay, clay, sandy clay, or silty clay loam
Clay content: 35 to 55 percent
Content of rock fragments: 0 to 10 percent—0 to 5 percent hard shale; 0 to 5 percent soft shale
Electrical conductivity: 4 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 30
Gypsum content: 0 to 1 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

Bnyz and Byz horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 4
Texture: Clay, silty clay, clay loam, or silty clay loam
Clay content: 35 to 55 percent
Content of rock fragments: 0 to 75 percent—0 to 30 percent hard shale, 0 to 55 percent soft shale
Electrical conductivity: 4 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 30
Gypsum content: 1 to 5 percent
Reaction: pH 7.9 to 9.0

15C—Weingart silty clay, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Weingart and similar soils: 85 percent

Minor Components
Gerdrum and similar soils: 0 to 3 percent
Bascovy and similar soils: 0 to 3 percent
Neldore and similar soils: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 3 percent
Cabbart and similar soils: 0 to 2 percent
Areas of slickspots: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

620C—Weingart silty clay loam, warm, 0 to 6 percent slopes

Setting

Landform: Sedimentary plains
Slope: 0 to 6 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Weingart and similar soils: 85 percent

Minor Components
Gerdrum and similar soils: 0 to 3 percent
Kobase and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 3 percent
Very shallow clayey soils: 0 to 3 percent
Neldore and similar soils: 0 to 2 percent
Areas of slickspots: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland

Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Yamacall Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans, stream terraces, and hills
Parent material: Alluvium
Slope range: 0 to 25 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine-loamy, mixed, frigid Aridic Ustochrepts

Typical Pedon

Yamacall loam, in an area of Delpoint-Yamacall loams, 8 to 15 percent slopes, in an area of rangeland, 1,000 feet south and 1,800 feet west of the northeast corner of sec. 28, T. 4 S., R. 55 E.

A—0 to 5 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; few very fine pores; neutral; abrupt smooth boundary.

Bw—5 to 15 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; few very fine and fine pores; disseminated lime; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk—15 to 31 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; few very fine pores; many fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—31 to 60 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 10 to 20 inches
Other features: In some pedons, the material below 40 inches consists of a strata of loam, silt loam, clay loam, and loamy sand.

A horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 3, 4, or 5 moist
Chroma: 2 to 4
Texture: Loam or silt loam
Clay content: 18 to 27 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Calcium carbonate equivalent: 0 to 5 percent
Effervescence: None to strongly
Reaction: pH 6.6 to 8.4

Bw horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or silt loam
Clay content: 18 to 30 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Reaction: pH 6.6 to 8.4

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or silt loam
Clay content: 18 to 30 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
Electrical conductivity: 0 to 4 mmhos/cm
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

BC horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or silt loam
Clay content: 18 to 30 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 9.0

86A—Yamacall loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yamacall and similar soils: 85 percent

Minor Components
Archin and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Kremlin and similar soils: 0 to 3 percent
Busby and similar soils: 0 to 2 percent
Soils that are calcareous throughout: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

86C—Yamacall loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yamacall and similar soils: 85 percent

Minor Components
Cabbart and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 3 percent
Kremlin and similar soils: 0 to 3 percent
Archin and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 2 percent
Soils with gravelly surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

86D—Yamacall loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 8 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yamacall and similar soils: 90 percent

Minor Components
Cabbart and similar soils: 0 to 2 percent
Delpoint and similar soils: 0 to 2 percent
Archin and similar soils: 0 to 2 percent
Cambeth and similar soils: 0 to 2 percent
Soils with darker colored surface layers: 0 to 1 percent
Soils that have slopes less than 8 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium

Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

186A—Yamacall-Havre loams, 0 to 2 percent slopes

Setting

Landform:
- Yamacall—Stream terraces
- Havre—Flood plains

Slope:
- Yamacall—0 to 2 percent
- Havre—0 to 2 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yamacall and similar soils: 70 percent
Havre and similar soils: 20 percent

Minor Components
Harlake and similar soils: 0 to 2 percent
Kremlin and similar soils: 0 to 2 percent
Cambeth and similar soils: 0 to 2 percent
Areas of channels with steep slopes: 0 to 1 percent
Poorly drained and ponded soils: 0 to 1 percent

Major Component Description

Yamacall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Havre
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

186C—Yamacall-Havre loams, 2 to 8 percent slopes

Setting

Landform:
- Yamacall—Stream terraces
- Havre—Flood plains

Slope:
- Yamacall—2 to 8 percent
- Havre—2 to 4 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yamacall and similar soils: 70 percent
Havre and similar soils: 20 percent

Minor Components
Delpoint and similar soils: 0 to 2 percent
Harlake and similar soils: 0 to 2 percent
Kremlin and similar soils: 0 to 1 percent
Archin and similar soils: 0 to 1 percent
Areas of channels with steep slopes: 0 to 1 percent
Poorly drained soils: 0 to 1 percent

Major Component Description

Yamacall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Havre
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland

Flooding: Rare
Available water capacity: Mainly 9.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

193C—Yamacall-Cambeth complex, 2 to 8 percent slopes

Setting

Landform:
- Yamacall—Alluvial fans and stream terraces
- Cambeth—Sedimentary plains

Slope:
- Yamacall—2 to 8 percent
- Cambeth—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yamacall and similar soils: 50 percent
Cambeth and similar soils: 35 percent

Minor Components
Delpoint and similar soils: 0 to 4 percent
Cabbart and similar soils: 0 to 3 percent
Soils calcareous throughout: 0 to 3 percent
Soils with darker colored surface layers: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 2 percent

Major Component Description

Yamacall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Cambeth
Surface layer texture: Silt loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

286C—Yamacall-Delpoint loams, 2 to 8 percent slopes

Setting

Landform:
- Yamacall—Alluvial fans
- Delpoint—Sedimentary plains

Slope:
- Yamacall—2 to 8 percent
- Delpoint—2 to 8 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yamacall and similar soils: 50 percent
Delpoint and similar soils: 35 percent

Minor Components
Cabbart and similar soils: 0 to 4 percent
Kremlin and similar soils: 0 to 4 percent
Soils that are calcareous throughout: 0 to 4 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Yamacall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Delpoint
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

386E—Yamacall-Cabbart loams, 15 to 35 percent slopes

Setting

Landform:
- Yamacall—Hills
- Cabbart—Hills

Position on landform:
- Yamacall—Backslopes and footslopes
- Cabbart—Shoulders and summits

Slope:
- Yamacall—15 to 25 percent
- Cabbart—15 to 35 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yamacall and similar soils: 50 percent
Cabbart and similar soils: 35 percent

Minor Components
Delpoint and similar soils: 0 to 3 percent
Blacksheep and similar soils: 0 to 3 percent
Cambeth and similar soils: 0 to 3 percent
Soils with gravelly or stony surfaces: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent
Poorly drained soils: 0 to 1 percent

Major Component Description

Yamacall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Cabbart
Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

586D—Yamacall-Delpoint-Cabbart loams, 8 to 15 percent slopes

Setting

Landform:
- Yamacall—Hills
- Delpoint—Hills
- Cabbart—Hills

Slope:
- Yamacall—8 to 15 percent
- Delpoint—8 to 15 percent
- Cabbart—8 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yamacall and similar soils: 40 percent
Delpoint and similar soils: 30 percent
Cabbart and similar soils: 15 percent

Minor Components
Cambeth and similar soils: 0 to 4 percent
Archin and similar soils: 0 to 3 percent
Soils that have slopes more than 15 percent: 0 to 3 percent
Kremlin and similar soils: 0 to 3 percent
Soils that are calcareous throughout: 0 to 2 percent

Major Component Description

Yamacall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Delpoint
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

Cabbart
Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Yawdim Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains and hills
Parent material: Semiconsolidated shale
Slope range: 4 to 70 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents

Typical Pedon

Yawdim silty clay loam, 4 to 15 percent slopes, in an area of rangeland, 1,200 feet north and 400 feet west of the southeast corner of sec. 24, T. 8 N., R. 58 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine subangular blocky structure; slightly hard, friable, very sticky, moderately plastic; many very fine roots; few fine and common very fine pores; slightly alkaline; gradual wavy boundary.

C—3 to 15 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; hard, friable, very sticky, moderately plastic; common very fine roots; few fine and common very fine pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Cr—15 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated shale that crushes to silty clay loam, grayish brown (2.5Y 5/2) moist.

Range in Characteristics

Depth to the Cr horizon: 10 to 20 inches
Taxonomic note: Map unit 631D is a taxadjunct to the Yawdim series in order to join soils that have an average soil temperature greater than 47 degrees F.

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 1 or 2
Clay content: 27 to 40 percent
Reaction: pH 6.6 to 7.8

C horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma: 1 to 4
Texture: Silty clay loam or silty clay
Clay content: 35 to 50 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

162D—Yawdim silty clay loam, 4 to 15 percent slopes

Setting

Landform: Sedimentary plains and hills
Slope: 4 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yawdim and similar soils: 85 percent

Minor Components
Neldore and similar soils: 0 to 3 percent
Abor and similar soils: 0 to 3 percent
Orinoco and similar soils: 0 to 3 percent
Very shallow clayey soils: 0 to 2 percent

Cabbart and similar soils: 0 to 2 percent
Soils that have slopes less than 4 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

262E—Yawdim-Blacksheep-Rock outcrop complex, 15 to 45 percent slopes

Setting

Landform:
- Yawdim—Hills
- Blacksheep—Hills
- Rock outcrop—Hills

Position on landform:
- Yawdim—Backslopes and footslopes
- Blacksheep—Backslopes and shoulders
- Rock outcrop—Shoulders and summits

Slope:
- Yawdim—15 to 45 percent
- Blacksheep—15 to 45 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Yawdim and similar soils: 40 percent
Blacksheep and similar soils: 30 percent
Rock outcrop: 20 percent

Minor Components
Bascovy and similar soils: 0 to 2 percent
Cabbart and similar soils: 0 to 2 percent
Very shallow loamy soils: 0 to 2 percent
Orinoco and similar soils: 0 to 2 percent
Soils with stony surface layers: 0 to 1 percent
Soils that have slopes less than 15 percent: 0 to 1 percent

Major Component Description

Yawdim
Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

Blacksheep
Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Rock outcrop
Definition: Consolidated sandstone and shale

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Yegen Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 2 to 15 percent
Annual precipitation: 15 to 17 inches

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Yegen loam, 8 to 15 percent slopes, in an area of rangeland, 2,000 feet north and 1,500 feet east of the southwest corner of sec. 3, T. 4 S., R. 60 E.

A—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate thick platy structure; slightly hard, very friable, slightly sticky, slightly plastic; common

very fine and fine roots; few very fine pores; neutral; abrupt smooth boundary.
Bt1—6 to 11 inches; dark grayish brown (2.5Y 4/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; strong medium subangular blocky structure; hard, firm, moderately sticky, slightly plastic; common very fine roots; few very fine pores; few distinct clay films on faces of peds and in pores; neutral; clear smooth boundary.
Bt2—11 to 32 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; moderate coarse prismatic structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine pores; few distinct clay films on faces of peds and in pores; neutral; abrupt smooth boundary.
Bk1—32 to 38 inches; light yellowish brown (2.5Y 6/4) sandy clay loam, light olive brown (2.5Y 5/6) moist; moderate coarse prismatic structure; hard, very friable, slightly sticky, slightly plastic; few very fine roots; few fine and medium masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.
Bk2—38 to 60 inches; pale yellow (2.5Y 7/3) sandy loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; few very fine roots; few fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Thickness of the mollic epipedon: 10 to 16 inches
Depth to the Bk horizon: 24 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 3 or 4 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 10 to 27 percent
Reaction: pH 6.6 to 7.3

Bt horizons
Hue: 10YR or 2.5Y
Value: 3, 4, or 5 dry; 2 to 4 moist
Chroma: 2 to 4
Texture: Sandy clay loam or clay loam
Clay content: 20 to 35 percent
Reaction: pH 6.6 to 7.3

Bk horizons
Hue: 2.5Y or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 3, 4, or 6
Texture: Sandy loam or sandy clay loam
Clay content: 5 to 30 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 8.4

41C—Yegen loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Yegen and similar soils: 85 percent

Minor Components
Reeder and similar soils: 0 to 4 percent
Moderately saline soils: 0 to 3 percent
Cabba and similar soils: 0 to 3 percent
Very deep sandy loam soils: 0 to 3 percent
Soils that have slopes less then 2 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41D—Yegen loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Yegen and similar soils: 85 percent

Minor Components
Reeder and similar soils: 0 to 4 percent
Moderately saline soils: 0 to 3 percent
Cabba and similar soils: 0 to 3 percent
Very deep sandy loam soils: 0 to 3 percent
Soils that have slopes less than 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

141C—Yegen-Rentsac complex, 2 to 8 percent slopes

Setting

Landform:
- Yegen—Alluvial fans
- Rentsac—Bedrock-floored plains

Slope:
- Yegen—2 to 8 percent
- Rentsac—2 to 8 percent

Mean annual precipitation: 15 to 17 inches

Composition

Major Components
Yegen and similar soils: 50 percent
Rentsac and similar soils: 35 percent

Minor Components
Reeder and similar soils: 0 to 4 percent
Cabba and similar soils: 0 to 4 percent
Very deep sandy loam soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 3 percent

Major Component Description

Yegen
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.2 inches

Rentsac
Surface layer texture: Sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Ynot Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium and eolian deposits
Slope range: 2 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Coarse-loamy, mixed Aridic Haploborolls

Typical Pedon

Ynot sandy loam, 2 to 8 percent slopes, in an area of rangeland, 40 feet south and 2,300 feet west of the northeast corner of sec. 14, T. 4 S., R. 61 E.

A—0 to 10 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; loose, very friable, nonsticky, nonplastic; common fine and many very fine roots; neutral; clear wavy boundary.

Bw1—10 to 19 inches; brown (10YR 5/3) sandy loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; few fine and common very fine pores; neutral; gradual smooth boundary.

Bw2—19 to 31 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and common very fine roots; common very fine pores and few fine pores; neutral; gradual wavy boundary.
C1—31 to 42 inches; pale brown (10YR 6/3) sandy loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; few very fine roots; neutral; gradual wavy boundary.
C2—42 to 60 inches; light brownish gray (2.5Y 6/2) sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Other features: Some soils are calcareous below a depth of 40 inches.

A horizon
Hue: 10YR or 2.5Y
Value: 2 or 3 moist
Chroma: 2 or 3
Clay content: 10 to 18 percent
Reaction: pH 6.1 to 7.3

Bw horizons
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Sandy loam or fine sandy loam
Clay content: 10 to 18
Reaction: pH 6.1 to 7.3

C horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: Sandy loam or fine sandy loam
Clay content: 10 to 18 percent
Reaction: pH 6.1 to 7.8

59C—Ynot sandy loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Ynot and similar soils: 85 percent

Minor Components
Archin and similar soils: 0 to 4 percent
Soils with gravelly surface layers: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Areas of blowouts: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

59D—Ynot sandy loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Ynot and similar soils: 85 percent

Minor Components
Archin and similar soils: 0 to 4 percent
Soils with gravelly surface layers: 0 to 3 percent
Yamacall and similar soils: 0 to 3 percent
Areas of blowouts: 0 to 3 percent
Soils with lighter colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Zatoville Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 2 to 8 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Fine, montmorillonitic, frigid Aridic Ustochrepts

Typical Pedon

Zatoville silty clay loam, 2 to 8 percent slopes, in an area of rangeland, 2,200 feet north and 2,100 feet west of the southeast corner of sec. 3, T. 4 S., R. 56 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; many very fine roots; few very fine pores; disseminated lime; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw—3 to 10 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, firm, moderately sticky, moderately plastic; many very fine roots; few very fine pores; disseminated lime; slightly effervescent; moderately alkaline; clear smooth boundary.

By1—10 to 13 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, moderately sticky, moderately plastic; common very fine roots; few very fine pores; common fine nests and seams of gypsum crystals; disseminated lime; slightly effervescent; moderately alkaline; clear smooth boundary.

By2—13 to 27 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; many fine and medium nests of gypsum crystals; disseminated lime; slightly effervescent; moderately alkaline; gradual smooth boundary.

By3—27 to 60 inches; light gray (5Y 7/2) silty clay loam, olive gray (5Y 5/2) moist; massive; extremely hard, extremely firm, moderately sticky, moderately plastic; few very fine roots; common reddish yellow (7.5YR 6/6) iron stains; common fine and medium nests of gypsum crystals; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F
Depth to the By horizon: 13 to 24 inches

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 27 to 40 percent
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.4 to 9.0

Bw horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Silty clay loam or silty clay
Clay content: 33 to 45 percent
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.4 to 9.0

By horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Silty clay loam or silty clay
Clay content: 30 to 45 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 30
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 9.0

178C—Zatoville silty clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Zatoville and similar soils: 85 percent

Minor Components
Gerdrum and similar soils: 0 to 3 percent
Kobase and similar soils: 0 to 3 percent
Marvan and similar soils: 0 to 3 percent
Areas of slickspots: 0 to 3 percent
Soils that have slopes less than 2 percent: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Zeona Series

Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Sand dunes
Parent material: Eolian deposits
Slope range: 4 to 15 percent
Annual precipitation: 12 to 15 inches

Taxonomic Class: Mixed, frigid Typic Ustipsamments

Typical Pedon

Zeona loamy fine sand, in an area of Zeona-Blacksheep-Rock outcrop complex, 4 to 15 percent slopes, in an area of rangeland, 1,500 feet south and 2,000 feet west of the northeast corner of sec. 32, T. 3 N., R. 55 E.

A—0 to 4 inches; yellowish brown (10YR 5/4) loamy fine sand, brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; common very fine and fine roots; neutral; gradual irregular boundary.
C1—4 to 16 inches; yellowish brown (10YR 5/4) loamy fine sand, brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; common very fine roots; neutral; gradual irregular boundary.
C2—16 to 60 inches; light yellowish brown (10YR 6/4) loamy fine sand; brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; few very fine roots; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Other features: Colors throughout the control section are typically “salt and pepper” with lighter- and darker-colored sand grains. Evidence of recent wind action such as thin dark layers and variations in textures are observable in some pedons. Some pedons are calcareous below 30 inches.

A horizon
Hue: 5Y, 2.5Y, 10YR, or 7.5YR
Value: 4, 5, 6, or 7 dry; 3, 4, 5, or 6 moist
Chroma: 2 to 4 or 6
Clay content: 0 to 10 percent
Reaction: pH 5.6 to 7.8

C horizons
Hue: 5Y, 2.5Y, 10YR, or 7.5YR
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 1 to 4
Texture: Loamy fine sand or fine sand
Clay content: 0 to 10 percent
Reaction: pH 6.1 to 8.4

119D—Zeona-Blacksheep-Rock outcrop complex, 4 to 15 percent slopes

Setting

Landform:
- Zeona—Sand dunes
- Blacksheep—Sedimentary plains and hills
- Rock outcrop—Hills

Slope:
- Zeona—4 to 15 percent
- Blacksheep—4 to 15 percent

Mean annual precipitation: 12 to 15 inches

Composition

Major Components
Zeona and similar soils: 40 percent
Blacksheep and similar soils: 30 percent
Rock outcrop: 15 percent

Minor Components
Very shallow loamy soils: 0 to 4 percent
Cabbart and similar soils: 0 to 3 percent
Archin and similar soils: 0 to 3 percent
Areas of blowouts: 0 to 3 percent
Areas with ponderosa pines: 0 to 2 percent

Major Component Description

Zeona
Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.4 inches

Blacksheep
Surface layer texture: Fine sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, sandy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Rock outcrop
Definition: Consolidated sandstone

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

References

Alexander, R.R. 1967. Site indexes for Engelmann spruce. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station Research Paper, RP-32.

American Association of State Highway and Transportation Officials (AASHTO). 1986. Standard specifications for highway materials and methods of sampling and testing. 14th edition, 2 volumes.

American Society for Testing and Materials (ASTM). 1988. Standard test method for classification of soils for engineering purposes. ASTM Standard D 2487-00.

Baker, F.S. 1925. Aspen in the Central Rocky Mountain Region. United States Department of Agriculture Bulletin 1291.

Brickell, J.E. 1968. A method for constructing site index curves from measurements of tree age and height—Its application to inland Douglas-fir. U.S. Department of Agriculture, Forest Service, Intermountain Research Station Research Paper INT-RP-47.

Brown, P.L., and G.R. Carlson. 1990. Grain yields related to stored soil water and growing season rainfall. Montana Agricultural Experiment Station Special Report Number 35.

Colton, R.B., R.W. Lemke, W. Richard, and R.M. Lindvall. 1961. Glacial map of Montana east of the Rocky Mountains. U.S. Geological Survey geologic map (1:500,000), I-0327.

Conner, R.C. 1993. Montana's forest resources. U.S. Department of Agriculture, Forest Service, Intermountain Research Station Resource Bulletin INT-RB-81.

Dahms, W.G. 1964. Gross and net yield tables for lodgepole pine. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR, Research Paper PNW-8.

Meyer, W.H. 1938. Yield of even-aged stands of ponderosa pine. U.S. Department of Agriculture, Technical Bulletin 630. Washington, DC.

Miller, M.R., W.M. Bermel, R.N. Bergantino, J.L. Sonderegger, P.M. Norbeck, and F.A. Schmidt. 1977. Compilation of hydrogeological data for southeastern Montana: Montana Bureau of Mines and Geology Open File Report 026.

Montana Department of State Lands, Division of Forestry, and U.S. Department of Agriculture, Forest Survey, Intermountain Forest and Range Experiment Station, Region 1. 1984. Timber resources of Eastern Montana. Working Circles 4, 5, 6, 7, and 8.

Myers, C.A. 1966. Yield tables for managed stands with special reference to the Black Hills. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station Research Paper RM-RP-21.

O'Brien R.A., and D.C. Collins. 1991. Forest statistics for land outside national forests in Eastern Montana, 1989. U.S. Department of Agriculture, Intermountain Research Station Research Bulletin INT-RB-71.

Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby. 1977. Forest habitat types of Montana. U.S. Department of Agriculture, Forest Service, Intermountain Research Station General Technical Report INT-GTR-34.

Sauerwein, W.J. 1979. Site index for black cottonwood. Compiled from British Columbia Forest Service data. U.S. Department of Agriculture, Soil Conservation Service, Western Region.

Soil Survey Division Staff. 1962. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 1990. Keys to soil taxonomy. 4th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

United States Department of Agriculture, Natural Resources Conservation Service. Montana Field Office Technical Guide, Section II.

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

United States Department of Agriculture, Soil Conservation Service. 1976. National range handbook.

Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. (See Sodic (alkali) soil.)

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hillslopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redox feature.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redox features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	more than 7.5

Avalanche chute. The track or path formed by an avalanche.

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes. Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular

to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding planes. Fine strata, less than 5-millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of cobbles or gravel. In some blowouts, the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Bouldery. Refers to a soil with .01 to 0.1 percent of the surface covered with boulders.

Bouldery soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments larger than 24 inches (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil material. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque. A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeters in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

COLE (coefficient of linear extensibility). (See Linear extensibility.)

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forestland capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse-grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer-textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion. In areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to

compression. Terms describing consistence are defined in the "Soil Survey Manual" (Soil Survey Division Staff, 1962).

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown, and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.
Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well-drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.
Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.
Poorly drained.—These soils commonly are so wet, at or near the surface, during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.
Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well-preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Footslope. The geomorphic component that forms the inner, gently inclined surface at the base of a hillslope. The surface profile is dominantly concave. In terms of gradational processes, a footslope is a transitional zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Giant ripple mark. The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in

wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Soil that is 15 to 35 percent, by volume, rounded or angular rock fragments up to 3 inches (7.6 centimeters) in diameter. Very gravelly soil is 35 to 60 percent gravel, and extremely gravelly soil is more than 60 percent gravel by volume.

Grazeable forestland. Land capable of sustaining livestock grazing by producing forage of sufficient quantity during one or more stages of secondary forest succession.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual" (Soil Survey Division Staff, 1962). The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A or E horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well-sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine-grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redox concentration.

Mean annual increment (MAI). The average annual increase in volume of a tree during its entire life.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Areas of color that differ from the matrix color. These colors are commonly attributes retained from the geologic parent material. (See Redox features for indications of poor aeration and impeded drainage.)

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well-decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Naturalized pasture. Forestland that is used primarily for the production of forage for grazing by livestock rather than for the production of wood products. Overstory trees are removed or managed to promote the native and introduced understory vegetation occurring on the site. This vegetation is managed for its forage value through the use of grazing management principles.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots.

For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile.

Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit. The range of moisture content within which the soil remains plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse-grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential natural community (PNC). The biotic community that would become established on an ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development. The PNC may include acclimatized or naturalized nonnative species.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the

potential natural plant community for that site. (See Similarity index.)

Range site. (See Ecological site.)

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redox concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redox depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redox features. Redox concentrations, redox depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redox feature.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, boulders, stones, cobbles, and gravel.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called

ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder. The uppermost inclined surface at the top of a hillside. It is the transitional zone from the backslope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay

(0.002 millimeters) to the lower limit of very fine sand (0.05 millimeters). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Similarity index. A similarity index is the percentage of a specific vegetation state plant community that is presently on the site.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from

saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with tillage, or stones cover .01 to 0.1 percent of the surface. Very stony means that 0.1 to 3.0 percent of the surface is covered with stones. Extremely stony means that 3 to 15 percent of the surface is covered with stones.

Stony soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Terracette. Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may or may not be induced by trampling of livestock such as sheep or cattle.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive, nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes are commonly gentle and linear in profile.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a

sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water-spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse-grained particles that are well distributed over wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

NRCS Accessibility Statement

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United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with the United States Department of Agriculture, Forest Service; United States Department of the Interior, Bureau of Land Management; and Montana Agricultural Experiment Station

MT011—Soil Survey of Carter County, Montana

Part II

The original maps and tables have been deleted from this online version. Since the soil survey's publication, more data on soil properties may have been collected, new interpretations developed, or existing interpretive criteria modified. Maps and current data tables can be accessed through the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/).

How to Use This Soil Survey

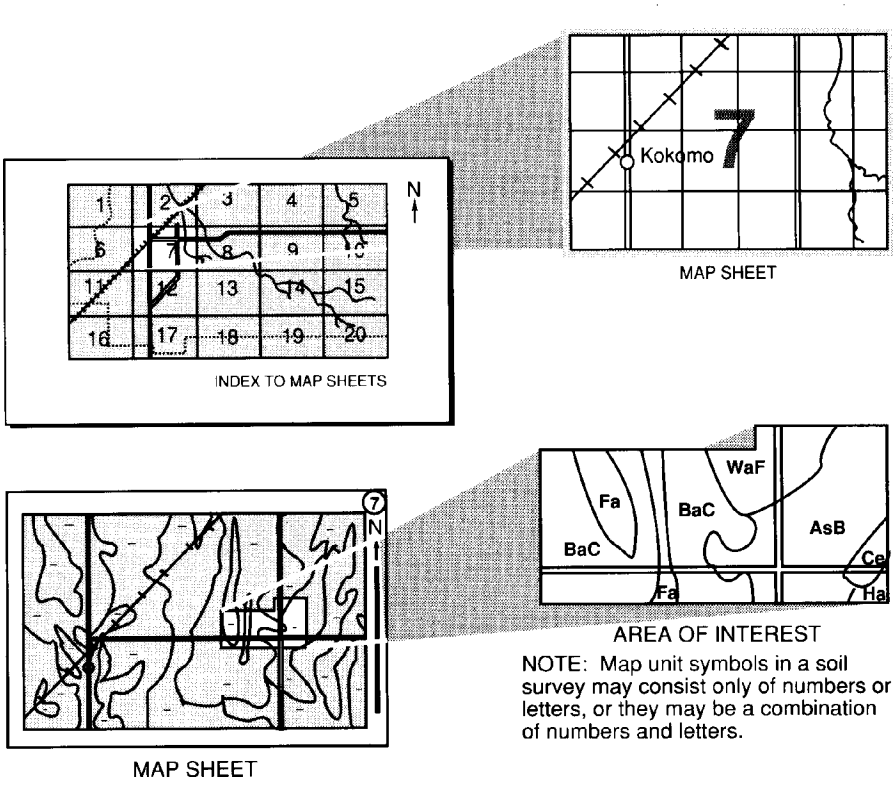
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, you can locate the Section, Township, and Range by zooming in on the **Index to Map Sheets**, or you can go to the Web Soil Survey at (http://websoilsurvey.nrcs.usda.gov/app/).

Note the map unit symbols that are in that area. The **Contents** lists the map units by symbol and name and shows the page where each map unit is described.

See the Contents for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies, including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the United States Department of Agriculture, Natural Resources Conservation Service and Forest Service; United States Department of the Interior, Bureau of Land Management; and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Carter County Conservation District.

The most current official data are available through the NRCS Soil Data Mart website at http://soildatamart.nrcs.usda.gov. Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Archin soils are in the foreground with the Long Pines in the background.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

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Detailed Soil Map Unit Legend

Summary of Tables

Part I

For tables with the most current data, please visit the Soil Data Mart at **http://soildatamart.nrcs.usda.gov/.**

Soil Survey of
Carter County, Montana

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. In addition, this survey can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. To predict soil behavior, field experience and collected data on soil properties and performance are used.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. This information can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Although soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The tables, “Classification of the Soils” and “Acreage and Proportionate Extent of the Soils,” at the end of this section show the classification and extent of the soils in this survey area.

Agronomy

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider obtaining specific information from local Natural Resources Conservation Service or Cooperative Extension Service offices.

Cropland Limitations and Hazards

Management concerns affecting the use of the detailed soil map units in the survey area for crops are shown in the table, "Main Cropland Limitations and Hazards." The main concerns in managing nonirrigated cropland are conserving moisture, controlling soil blowing and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water infiltration rate. Applying conservation tillage and conservation-cropping systems, establishing field windbreaks, farming on the contour, leaving crop residue on the surface, and stripcropping conserve moisture.

Generally, a combination of several practices is needed to control *soil blowing* and *water erosion*. Conservation-cropping systems, conservation tillage, contour farming, crop-residue management, diversions, field windbreaks, grassed waterways, stripcropping, and tall grass barriers help to prevent excessive soil loss.

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green-manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients, helping to maintain productivity. The level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the limitations and hazards shown in the table cannot be easily overcome. These are *channels, depth to rock, flooding, gullies, lack of timely precipitation*, and *ponding.*

Additional limitations and hazards are as follows:

Areas of rock outcrop and slickspots—Farming around these areas may be feasible. Subsoiling or deep ripping soft sedimentary beds increases the effective rooting depth and the rate of water infiltration.

Excessive permeability—This limitation causes deep leaching of nutrients and pesticides. The capacity of the soil to retain moisture for plant use is poor.

Lime content, limited available water capacity, poor tilth, restricted permeability, and *surface crusting*—These limitations can be overcome by incorporating crop residue, green-manure crops, or manure into the soil; applying a system of conservation tillage; and using conservation-cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Potential for ground-water pollution—This limitation is a hazard in soils with excessive permeability, hard bedrock, or a water table within the profile.

Short frost-free period—If the growing season is less than 90 days, short-season crops or grasses should be grown.

Slope—Where the slope is more than 8 percent, soil blowing and water erosion may be accelerated unless conservation-farming practices are applied.

Surface rock fragments—This limitation causes rapid wear of tillage equipment; it cannot be easily overcome.

Surface stones—Stones or boulders on the surface can hinder normal tillage unless they are removed.

Salt and sodium content—In areas where this is a limitation, only salt- and sodium-tolerant crops should be grown.

On irrigated soils, the main management concerns are *efficient water use, nutrient management, control*

of erosion, pest and weed control, and *timely planting and harvesting* for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. Overirrigation can also create drainage problems, raise the water table, and increase soil salinity.

Following is an explanation of the criteria used to determine the limitations or hazards.

Areas of rock outcrop—Rock outcrop is a named component of the map unit.

Areas of rubble land—Rubble land is a named component of the map unit.

Areas of slickspots—Slickspots are a named component of the map unit.

Channeled—The word "channeled" is included in the name of the map unit.

Depth to rock—Bedrock is within a depth of 40 inches.

Excessive permeability—The upper limit of the permeability range is 6 inches or more within the soil profile.

Flooding—The component of the map unit is occasionally flooded or frequently flooded.

Gullied—The word "gullied" is included in the name of the map unit.

Lack of timely precipitation—The component of the map unit has a xeric moisture regime, and the amount of annual precipitation is no more than 14 inches.

Lime content—The component is assigned to wind erodibility group 4L or has more than 5 percent lime in the upper 10 inches. Wind erodibility groups are defined in the "Soil Properties" section.

Limited available water capacity—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 5 inches or less.

Ponding—Ponding duration is assigned to the component of the map unit.

Poor tilth—The component of the map unit has more than 35 percent clay in the surface layer.

Potential for ground-water pollution—The soil has a water table within a depth of 4 feet or hard bedrock within the profile, or permeability is more than 6 inches per hour within the soil.

Restricted permeability—Permeability is 0.06 inch per hour or less within the soil profile.

Salt content—The component of the map unit has an electrical conductivity of more than 4 in the surface layer or more than 8 within a depth of 30 inches.

Short frost-free period—The map unit has a growing season of less than 90 frost-free days.

Slope—The upper slope range of the component of the map unit is more than 8 percent.

Sodium content—The sodium adsorption ratio of the component of the map unit is more than 13 within a depth of 30 inches.

Soil blowing—The wind erodibility index multiplied by the selected high C factor for the survey area and then divided by the T factor is more than 8 for the component of the map unit.

Surface crusting—The sodium adsorption ratio in the surface layer is 5 or more for any texture and 4 or more if the texture is silt, silt loam, loam, or very fine sandy loam.

Surface rock fragments—The terms describing the texture of the surface layer include any rock fragment modifier except for gravelly or channery, and "surface stones" is not already indicated as a limitation.

Surface stones—The terms describing the texture of the surface layer include any stony or bouldery modifier or the soil is a stony or bouldery phase.

Water erosion—The surface K factor multiplied by the upper slope limit is more than 2 (same as prime farmland criteria).

Water table—The component of the map unit has a water table within a depth of 60 inches.

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops under a high level of management are shown in the table, "Land Capability and Yields per Acre of Crops and Pasture." In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit is shown in the table.

The nonirrigated small grain yields presented are a maximum potential estimated using a crop yield model based on Montana Agricultural Experiment Station Special Report Number 35 (Brown and Carlson 1990). Basic model assumptions include soil moisture at field capacity to 40 inches, a 70 percent annual precipitation probability as published by the National Climatic Center, fertilization to yield, and full pest and weed control. Irrigated small grain yields are not provided. The model has been validated with collected yield data.

Forage crop yields are estimates based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil

and the crop. Management can include improving drainage; controlling erosion; protecting areas from flooding; selecting proper planting and seeding rates; choosing suitable high-yielding crop varieties; appropriately and timely tilling; controlling weeds, plant diseases, and harmful insects; ensuring favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effectively using crop residue, barnyard manure, and green-manure crops; and harvesting to ensure the smallest possible loss. Yields for dryland crops are based on a crop-fallow-rotation system.

For provided yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the forage crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Pasture and Hayland Management

Soils are assigned to pasture and hayland groups according to their suitability for the production of forage. The soils in each group are similar enough to be suited to the same species of grasses or legumes, have similar limitations and hazards, require similar management, and have similar productivity levels and other responses to management.

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Yield estimates are often indicated in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about forage yields other than those shown in the table, “Land Capability and Yields per Acre of Crops and Pasture.”

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, as described in “Land Capability Classification” (U.S. Department of Agriculture, 1961), soils generally are grouped at three levels: capability class, subclass, and unit. These levels indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grains, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 5. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7. Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide guidance on the use of these soils as cropland.

Areas in class 8 are generally not suitable for cropland, pasture, or woodland without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses indicate the dominant limitations in the class. These subclasses are designated by adding a letter, *E, W, S,* or *C,* to the class numeral, for example, 2E. The letter *E* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *W* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *S* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *C*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *W, S,* or *C* because the soils in class 5 are subject to little or no erosion. Class 5 soils have other limitations that restrict their use mainly to pasture, rangeland, recreation, wildlife habitat, or woodland.

The capability classification of each map unit is given in the table, "Land Capability and Yields per Acre of Crops and Pasture."

Prime Farmland and Other Important Farmland

In this section, prime farmland and other important farmland are defined. The soils in the survey area that are considered prime farmland are listed in the table, "Prime and Important Farmland."

Prime Farmland

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, woodland, or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as commercial, housing, and industrial sites; sites for institutions or public buildings; small parks; golf courses; cemeteries; railroad yards; airports; sanitary landfills; sewage treatment plants; and water-control structures. Public land is land not available for farming in military reservations, national forests, national parks, and state parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity and the content of salts and sodium are acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods, and they are not frequently flooded during the growing season or are protected from flooding. Slopes range mainly from 0 to 6 percent.

Soils that have a high water table, are subject to flooding, or are droughty may qualify as prime farmland where these limitations are overcome by drainage measures, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. The local office of the Natural Resources Conservation Service can provide more information about the criteria for prime farmland.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

The map units in the survey area that meet the requirements for prime farmland are listed in the table, "Prime and Important Farmland." On some soils included in the table, measures that overcome limitations are needed. The need for these measures is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described in the "Soil Series and Detailed Soil Map

Units" section. This list does not constitute a recommendation for a particular land use.

Unique Farmland

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil qualities, location, growing season, and moisture supply needed for the economic production of sustained high yields of a specific high-quality crop when treated and managed by acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, and vegetables.

Unique farmland is used for a specific high-value food or fiber crop; has an adequate supply of available moisture for the specific crop because of irrigation, precipitation, or stored moisture; and has a combination of air drainage, aspect, elevation, growing season, humidity, soil qualities, temperature, and other factors, such as nearness to markets, that favors the production of a specific food or fiber crop.

Lists of unique farmland are developed as needed in cooperation with conservation districts and others.

Additional Farmland of Statewide Importance

Some areas other than areas of prime and unique farmland are of statewide importance in the production of food, feed, fiber, forage, and oilseed crops. The criteria used in defining and delineating these areas are determined by the appropriate state agency or agencies. Generally, additional farmland of statewide importance includes areas that nearly meet the criteria for prime farmland and that economically produce high yields of crops when treated and managed by acceptable farming methods. Some areas can produce as high a yield as areas of prime farmland if conditions are favorable. In some states, additional farmland of statewide importance may include tracts of land that have been designated for agriculture by state law.

Farmland of statewide importance is included in the list of prime farmland. Criteria is available in the "Montana Field Office Technical Guide" (U.S. Department of Agriculture, Natural Resources Conservation Service, Section II).

Additional Farmland of Local Importance

This land consists of areas that are of local importance in the production of food, feed, fiber, forage, and oilseed crops and are not identified as having nationwide or statewide importance. Where appropriate, this land is identified by local agencies. It may include tracts of land that have been designated for agriculture by local ordinance.

Lists of this land are developed as needed in cooperation with conservation districts and others.

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices.

Soil Erodibility (K) Factor

The soil erodibility factor (K) indicates the susceptibility of a soil to sheet and rill erosion by water. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand; the content of sand coarser than very fine sand; and the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. Kf factor shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance factor (T) is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullying, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index factor (I) is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter. Wind erodibility groups are defined in the "Soil Properties" section.

Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide additional information about wind erodibility groups and K, Kf, T, and I factors.

Windbreaks and Environmental Plantings

Windbreaks protect buildings, cropland, fruit trees, gardens, livestock, and yards from wind and snow; help to keep snow on fields; and provide food and cover for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well-prepared site and maintained in good condition.

Windbreaks are often planted on land that did not originally support trees. Knowledge of how trees perform on such land can be gained only by observing and recording the performance of planted trees that have survived. Many popular windbreak species are not indigenous to the areas in which they are planted.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree or shrub may grow well or poorly, depending on the characteristics of the soil. Each tree or shrub has definable potential heights in a given physiographic area and under a given climate. Accurate definitions of potential heights are necessary when a windbreak is planned and designed.

The "Windbreak Suitability Groups Species List" table shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in this table are based on measurements and observations of established plantings that have been given adequate care. They can be used as a guide in planning screens and windbreaks. Additional information on planning screens and windbreaks and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a nursery.

Windbreak Suitability Groups

Windbreak suitability groups consist of soils in which the kinds and degrees of the hazards or limitations that affect the survival and growth of trees and shrubs in windbreaks are about the same. The "Windbreak Suitability Groups" table shows the windbreak suitability group for each component of each map unit in the county.

Group 1 consists of soils that have no soil-related hazards or limitations or only slight hazards or limitations if they are used for windbreaks. Slopes are less than 15 percent.

Group 2M consists of soils that have a moderate available water capacity (5 to 10 inches) because of texture, depth, or both. The soils are well drained and not affected by salinity. A layer of concentrated lime, if it occurs, is below a depth of 24 inches. Slopes are less than 15 percent.

Group 2L consists of soils that have a layer of concentrated lime (more than 15 percent calcium carbonate equivalent) at a depth of about 15 to 24 inches. Available water capacity is at least 5 inches. Soils are well drained and not affected by salinity or alkalinity. (Electrical conductivity is less than 4 millimhos per centimeter.) Slopes are less than 15 percent.

Group 2W consists of soils that have an available water capacity of 5 inches or more. If the soils have a layer of concentrated lime, the layer is below a depth of 15 inches. Depth to a permanent water table is 30 to 60 inches. Soils are not affected by salinity. Slopes are less than 15 percent.

Group 2S consists of soils that are moderately affected by salinity. (Electrical conductivity is 4 to 12 millimhos per centimeter.) Available water capacity is at least 5 inches. A layer of concentrated lime, if it occurs, is at a depth of 15 inches or more. The water

table is at a depth of 30 inches or more. Slopes are less than 15 percent.

Group 3M consists of soils that have an available water capacity of 2 to 5 inches because of texture, depth, or both. A layer of concentrated lime, if it occurs, is at a depth of 15 inches or more. Soils are well drained and not affected by salinity. (Electrical conductivity is less than 4 millimhos per centimeter.)

Group 3L consists of soils that have a layer of concentrated lime (more than 15 percent calcium carbonate equivalent) at a depth of less than 15 inches. A permanent water table is at a depth of more than 30 inches. Available water capacity is more than 5 inches. Soils are not affected by salinity. (Electrical conductivity is less than 4 millimhos per centimeter.) Slopes are less than 15 percent.

Group 3W consists of soils that have an available water capacity of 2 inches or more. If the soils have a layer of concentrated lime, the layer is below a depth of 15 inches. Depth to a permanent water table is 30 inches or less. The water table is more than 10 inches during all or most of the growing season. Soils are not affected by salinity. Slopes are less than 15 percent.

Group 3S consists of soils that are severely affected by salinity or alkalinity. (Electrical conductivity is 12 to 16 millimhos per centimeter.) Available water capacity is 5 inches or more. A layer of concentrated lime, if it occurs, is at a depth of more than 15 inches. A permanent water table is at a depth of 30 inches or more. Slopes are less than 15 percent.

Group 4 consists of soils that have slopes of more than 15 percent, except for soils in areas where the length of the slopes is 100 feet or less and the less sloping soils have very severe limitations, including soils that have a very low available water capacity (2 inches or less); very shallow, stony, or gravelly soils; strongly saline and alkali soils, in which the electrical conductivity is more than 16 millimhos per centimeter; and soils that have a pH of more than 9.0. Rock outcrop is also in this group.

Range

Range makes up about 90 percent of the land in Carter County. Of the 90 percent, 71 percent is under private ownership, 21 percent is Federal land administered by the Bureau of Land Management and the Forest Service, and 8 percent is under state ownership. Areas of range provide forage for cow-calf pairs and sheep and lambs. Nearly 80 percent of farm income in the county is derived from the sale of livestock. Sheep is the major type of livestock operation in the area. The average size of a ranch is 6,100 acres.

Most grazing is on native range. Introduced tame pastures with species, such as crested wheatgrass, Russian wildrye, and pubescent wheatgrass, are grazed during periods of the growing season depending on the time at which the species are best adapted. For example, crested wheatgrass and Russian wildrye are early spring grasses; they initiate growth early and become grazeable in April and May when their palatability and nutrition are at optimum levels.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on range are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rangeland is defined as land on which the historic climax plant community is predominantly grasses, grasslike plants, forbs, or shrubs. Rangeland includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of grazing. Rangeland includes natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows. The composition and production of the plant community are determined by soil, climate, topography, overstory canopy, and grazing management (U.S. Department of Agriculture, 1976).

Grazeable forestland is defined as land on which the understory includes, as an integral part of the forest plant community, plants that can be grazed without significant impairment of other forest values.

Native and naturalized pasture are defined as forestland and naturalized open areas, other than rangeland, that are used primarily for the production of forage for grazing by livestock and wildlife. Overstory trees, if present, are managed to promote naturally occurring native and introduced understory forage species occurring on the site (U.S. Department of Agriculture, 1976).

The “Rangeland and Grazeable Understory—Productivity and Characteristic Plant Communities” table shows, for each listed soil, the ecological site (rangeland ecological site or representative habitat type); the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic native vegetation; and the average percent composition of each species. Only those soils that are used as rangeland or grazeable forestland, or are suited to use as rangeland, are listed. Explanation of the column headings in this table follows.

Ecological site includes rangeland ecological site and representative habitat type as defined below.

Rangeland ecological site is a distinctive kind of rangeland with specific physical characteristics, which differs from other kinds of rangeland in its ability to produce a distinctive kind and amount of vegetation (U.S. Department of Agriculture, 1976).

Many different ecological sites are in the survey area. Over time, the combination of plants best suited to a particular soil and climate has become established. If the soil is not excessively disturbed, this group of plants is the natural plant community for the site. Natural plant communities are not static but vary slightly from year to year and place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, ecological sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. The “Montana Field Office Technical Guide,” (U.S. Department of Agriculture, Natural Resources Conservation Service, Section II)

available at local offices of the Natural Resources Conservation Service, can provide specific information about rangeland ecological sites.

Representative habitat type is an aggregation of all land areas capable of producing similar climax plant communities. Habitat types are considered basic ecological subdivisions of landscapes. Each is recognized by distinctive combinations of overstory and understory plant species at climax. They are named for the dominant or characteristic vegetation of the climax community. Habitat types are useful in soil surveys when assessing the combined effects of aspect, slope, elevation, and soil properties on potential plant growth. The representative habitat type or phase displayed in this table is documented in the Pfister system (Pfister and others, 1977).

Total annual production is the amount of vegetation that can be expected to grow annually on well-managed range that is supporting the historic climax plant community. Total annual production includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants up to a height of 4.5 feet. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation, along with temperature, make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as, amount of shade, exposure, recent rains, and unseasonable dry periods.

Characteristic native vegetation consists of the forbs, grasses, and shrubs that make up most of the potential natural plant community on each soil. The plants are listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. For grazed forestland the table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of forestland in which the production of wood crops is highest.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Similarity Index

Similarity index, one method to evaluate an ecological site, compares the present plant community to the historic climax plant community for that site or to a desired plant community that is one of the site's potential vegetation states. The similarity index to the historic climax plant community is the percentage, by weight, of historic climax vegetation present on the site. Likewise, a similarity index to a desired plant community is the percentage, by weight, of the desired plant community present on the site. As the name implies, this method assesses the similarity of the plant community to the historic climax or desired plant community. The similarity index can provide an indication of past disturbances, as well as future management or treatment, or both, needed to achieve the client's objectives (U.S. Department of Agriculture, 1976).

Abnormal disturbances that change the natural plant community include repeated overuse by livestock, excessive burning, erosion, and plowing. Grazing animals select the most palatable plants within a community. These plants will eventually die if they are continually grazed. A very severe disturbance can destroy the natural community. Under these conditions, less desirable plants, such as annuals and weeds, can invade. If the plant community has not deteriorated significantly, it eventually can return to dominantly natural plants if proper grazing management is applied.

Knowledge of the ecological site and the similarity index is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to determine management objectives, proper grazing systems and stocking rates, suitable wildlife management practices, potential for recreational uses, and condition of watersheds.

Rangeland Management

Rangeland management requires a knowledge of the kinds of soil and of the potential natural plant

community. It also requires knowledge of the similarity index for the ecological site.

The objective in grazing land management is to provide the kind of plant community that provides for and maintains a healthy ecosystem, produces quality forage for the grazing animals, and meets the needs of the grazing land enterprise and the desires of the landowner (U.S. Department of Agriculture, 1976). Proper grazing management generally results in the optimum production of vegetation, reduction of less desirable species, conservation of water, and control of erosion. Sometimes, however, a similarity index percentage somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Grazing management is the most important part of any rangeland management program. Proper grazing use, timely deferment of grazing, and planned rotation grazing systems are key practices. The experience of ranchers and research has shown that if no more than one-half of the current year's growth is grazed, a plant community in good or excellent condition can be maintained, and one in fair condition can be improved. The remaining one-half enables plants to make and store food for regrowth and root development. As a result, the desirable plants remain healthy and are not replaced by less desirable grasses and weeds. Also, the plant cover protects the soil from water erosion and soil blowing, increases moisture retention, improves tilth, increases the rate of water infiltration, and helps to control runoff.

Certain practices commonly are needed to obtain a uniform distribution of grazing. These practices include developing livestock watering facilities, fencing, properly locating salt and mineral supplements, constructing livestock trails in steeply sloping areas, and riding or herding.

Various kinds of grazing systems can be used in range management. No single grazing system is best under all conditions. The grazing system should increase the quantity and improve the quality of the range vegetation; should meet the needs of the individual operator; and should be designed according to topography, type of grazing animals, and resource management objectives.

Special improvement practices are needed in areas where management practices do not achieve the desired results or where recovery is too slow under forage management alone. These practices include range seeding, brush management, water spreading, prescribed burning, and mechanical treatment.

Some soils are suited to mechanical treatment for range improvement. On other soils, however, only proper grazing management can improve the range. . The "Agronomy" section defines capability classes. They are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. Many soils in capability classes 1 through 4 are suited to such practices as seeding, mechanical brush and weed control, and water spreading. Those soils in capability classes 7 and 8, however, are not suitable. Many soils in capability classes 1 through 4 are suited to tillage for seedbed preparation before native or introduced forage plant species are seeded. Soils in capability class 6 may be suited to limited surface disturbance, such as scarification, for seeding and as a means of increasing the rate of water infiltration for seed germination.

Where feasible, mechanical renovation practices, such as shallow chiseling, can help to speed recovery of desired plants. These practices open up the surface and thus allow absorption of more moisture and production of more desirable plants. Mechanical renovation, brush management, and timely deferment of grazing allow recovery of the desired plants.

Seeding may be needed in areas where less desirable plants are dominant. A clean, firm seedbed should be prepared, suitable species should be selected for seeding, and rest periods should be long enough to allow the new plants to become established. Special improvement practices can be effective only if the management system helps to keep the desirable plants healthy.

Understory Management

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some forestland can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

Forest understory production can be influenced by controlling canopy density in addition to the management of stocking rates, distribution, and season of use. Often both the woodland and range resources can be enhanced through thinning the overstory to canopy levels that optimize both timber and forage production. Broadcast seeding of disturbed areas soon after timber harvest can improve forage quantity and quality and reduce the chances of undesirable plants occupying the site.

Steepness of slopes and distance to drinking water are severe grazing management problems in much of the mountain and foothill area. Variations in primary season of use, production levels, and plant

communities because of elevation and aspect changes present additional challenges. Long, steep slopes provide limited access to livestock. Less sloping areas are subject to over use. Grazing should be delayed until the soil is firm enough to withstand trampling and the plants have matured enough to withstand grazing pressure.

Riparian areas should be protected from overuse by livestock. Misuse results in deterioration of the protective vegetation, reduction of streambank stability, and excessive erosion. Developing off stream watering locations can successfully prevent cattle from overgrazing riparian areas and encourage better livestock distribution.

Forestland

Forest managers can use the "Forestland Management" and "Forestland Productivity" tables to plan the use of soils for wood crops. Only those soils suitable for wood crops are listed.

Woodland Ordination System

The table, "Forestland Management," lists the ordination (woodland suitability) symbol for each soil. The ordination system is a nationwide uniform system of labeling soils or groups of soils that are similar in use and management. The primary factors evaluated in the woodland ordination system are productivity of the forest overstory tree species and the principal soil properties resulting in hazards and limitations that affect forest management. There are three parts of the ordination system—class, subclass, and group. The class and subclass are referred to as the ordination symbol.

Ordination Class Symbol

The first element of the ordination symbol is a number that denotes potential productivity in terms of cubic meters of wood per hectare per year for the indicator tree species; the larger the number, the greater the potential productivity. Potential productivity is based on site index and the corresponding culmination of mean annual increment. For example, the number 1 indicates a potential production of 1 cubic meter of wood per hectare per year (14.3 cubic feet per acre per year), and 10 indicates a potential production of 10 cubic meters of wood per hectare per year (143 cubic feet per acre per year).

Indicator species is a species that is common in the area and is generally, but not necessarily, the most productive on the soil. It is the species that determines the ordination class. In the "Forestland Productivity" table, an indicator species is the first species listed for a particular map unit. This table shows the productivity for all species where data have been collected.

Site index is determined by taking height measurements and determining the age of selected trees within stands of a given species (Alexander, 1966). This index is the average height, in feet, that the trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The site indexes shown in the "Forestland Productivity" table are averages based on measurements made at sites that are representative of the soil series. When the site index and forestland productivity of different soils are compared, the values for the same tree species should be compared (Dahms, 1964). The higher the site index number, the more productive the soil for that species. Site index values are used in conjunction with yield tables (Myers, 1966) to determine mean annual yields. Indirectly, they are used to determine the productivity class in the ordination class symbol.

Expected tree growth rate and tree diversity on a site are determined by a combination of aspect, climate, elevation, and soils. The ability of soils to support tree growth is dependent on variability in soil depth, fertility, texture, and available water capacity. Forested soils in the area range from shallow to very deep, nongravelly to extremely gravelly, fine textured to coarse textured, and those containing no lime to those containing high amounts of lime.

Listed below is information pertaining to the development of forestland tables in the area. Site index ratings were developed using the following references: black cottonwood (Sauerwein, 1979), Douglas-fir (Brickell, 1968), Engelmann spruce (Alexander, 1967), lodgepole pine (Alexander, 1966), and quaking aspen (Baker, 1925).

Productivity ratings were made based on timber being harvested by the clear-cut method and slash burned. It is assumed that reasonable care was used in logging, so that funneling of skid trails did not occur to concentrate the water; excessive disturbance did not occur; and coarser material from slash disposal remained.

Equipment limitations were related to logging operations. Of prime consideration were difficulties

encountered in yarding logs and the influence of logging activities on soil properties. Primary soil features considered for this rating were seasonal soil wetness, slope, soil depth, soil texture, and stoniness.

Seedling mortality ratings apply to planting stock 1 or 2 years of age, with the evaluation period beginning at the time of planting. For natural regeneration, the evaluation period was considered to begin a year after germination.

Windthrow hazard ratings were developed as follows:

Soils on north slopes that remain moist into the spring, and those having a high basal area to limit root development, were considered moderately prone to windthrow even though the soil materials provided a good anchoring medium for tree roots. On drier sites, clayey soils without rock fragments were also considered in this category.

Soils having a high water table (within 20 inches of the surface) long enough to inhibit root development were considered to be severely susceptible to windthrow.

When making ratings for plant competition, the limitation was considered slight if adequate regeneration usually occurs on a soil within 5 years.

For most species, overstory yield estimates were determined from the average annual yield versus site index curves. These curves were developed by adjusting data presented in yield tables published from several different sources. Average annual yield values were computed at the culmination of mean annual increment. Total cubic-foot-volume estimates are based on trees that are more than 4-inch diameter breast height.

"Even-aged Stands of Ponderosa Pine" (Meyer, 1938) was used for estimating yields of Douglas-fir and ponderosa pine. Board-foot volumes are based on Scribner's log rule and include all trees larger than 10-inch diameter breast height to an 8-inch top diameter inside bark (Dahms, 1964). "Aspen in the Central Rocky Mountain Region" (Baker, 1925) was used to estimate quaking aspen yields.

Ordination Subclass Symbol

The second element, or subclass, of the ordination symbol is a capital letter that indicates certain soil or physiographic characteristics that contribute to important hazards or limitations to be considered in management. The subclasses are defined as follows:

Subclass X indicates that forestland use and management are limited by stones or rocks.

Subclass W indicates that forestland use and management are significantly limited by excess water, either seasonally or throughout the year. Restricted drainage, a high water table, or flooding can adversely affect either stand development or management.

Subclass T indicates that forestland use and management are limited by a root zone that has toxic substances. Excessive alkalinity, acidity, sodium salts, or other toxic substances impede the development of desirable species.

Subclass D indicates that forestland use and management are limited by a restricted rooting depth. The rooting depth is restricted by hard bedrock, a hardpan, or other restrictive layers in the soil.

Subclass C indicates that forestland use and management are limited by the kind or amount of clay in the upper part of the soil.

Subclass S indicates that forestland use and management are limited by sandy soil, a low available water capacity, and a normally low content of available plant nutrients. The use of equipment is limited during dry periods.

Subclass F indicates that forestland use and management are limited by a high content of rock fragments that are larger than 2 millimeters and smaller than 10 inches. This subclass includes flaggy soils.

Subclass R indicates that forestland use and management are limited by excessive slope.

Subclass A indicates that no significant limitations affect forestland use and management.

Forestland Management and Productivity

Information about the management and productivity of the forested map units in the survey area is given in the "Forestland Management" and "Forestland Productivity" tables.

Management Concerns

In the "Forestland Management" table, the soils are rated for erosion hazard, equipment limitation, seedling mortality, windthrow hazard, and plant competition.

Erosion hazard is *slight* if there is little or no hazard of erosion, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive soil loss.

Equipment limitation is *slight* if the use of equipment is not limited to a particular kind of equipment or time of year; *moderate* if there is a short

seasonal limitation or a need for some modification in the management of equipment; and *severe* if there is a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings are for seedlings from good planting stock that are properly planted during a period of average rainfall. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Windthrow hazard is *slight* if trees in wooded areas are not expected to be blown down by commonly occurring winds, *moderate* if some trees are blown down during periods of excessive soil wetness and strong winds, and *severe* if many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Plant competition is *slight* if there is little or no competition from other plants; *moderate* if plant competition is expected to hinder the development of a fully stocked stand of desirable trees; and *severe* if plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

Potential Productivity

The potential productivity of merchantable or *common trees* is expressed as a site index, which is described under the heading “Ordination Class Symbol.” Commonly grown trees are those that forestland managers generally favor in intermediate or improvement cuttings. They are selected based on growth rate, quality, value, and marketability.

The column, *Trees that stands are commonly managed for,* in the “Forestland Productivity” table lists trees that are suitable for commercial wood production and that are suited to the soils.

Main Forest Access Road Limitations and Hazards

The major management concerns affecting the use of the detailed soil map units in the survey area for forest access roads are listed in the “Main Forest Access Road Limitations and Hazards” table. The significance of each limitation or hazard and the criteria used to determine the limitation or hazard are described in this section.

Areas of rock outcrop and *depth to bedrock* can increase the cost of road construction and influence route planning. Constructing roads is difficult because of the need for rock removal and the need for additional soil material to provide a suitable road surface.

Boulders increase the cost of road construction and influence route planning. Construction is difficult mainly because of the need for extraction and disposal of the boulders.

Dustiness of the road surface material may cause safety problems and accelerate equipment wear. Dust-abatement measures are needed during dry periods.

The erodibility of the soil material in the roadbed influences the probability of *erosion by water* resulting from the channeling of runoff in the roadway. Erosion can result in the sedimentation of streams. It can be controlled by reducing road grades and controlling runoff onto and off of the road surface through the installation of drainage measures.

Flooding in the area where a road is constructed may restrict use, result in damage to the roadway, and result in the sedimentation of waterways. The hazard of flooding can be reduced by installing a drainage system, elevating the roadbed, and using riprap and diversions.

Low soil strength of the soil material used to construct the road surface can result in rutting, in drainage problems, and in poor trafficability during wet periods. The road should be used only during dry periods or when the surface is frozen. Surfacing with material of suitable strength and installing a drainage system can help to overcome this limitation.

Roadbed material that has a high *shrink-swell potential* shrinks and swells markedly during dry and wet periods. Excessive shrinking and swelling can damage the road surface or other features, such as bridge abutments, culverts, and erosion-control structures.

A steep *slope* results in increased construction and maintenance costs and increased sedimentation because of the large cuts necessary to create an adequate roadbed. Seeding the cut slope to suitable vegetation minimizes sedimentation. Large cuts can increase instability of the slope. Where slumping is a hazard, slope failure can become a significant maintenance and environmental problem.

Slumping causes safety problems and increases maintenance costs. Frequent clearing of slumped soil in the roadbed or rebuilding of the roadway may be needed to keep the road serviceable and drainage systems functioning.

Stones cause problems in maintaining a smooth road surface that has good trafficability. Unless the stones are removed, additions of suitable stone-free material may be needed when the road is surfaced.

Roads built across soils that have a *water table* may require substantial ballast, fabric, internal drainage systems, and other measures that maintain a road surface that has good trafficability. Construction and use of the road only during periods when the water table is not near the surface or when the road is frozen help to maintain trafficability and reduce the potential for site damage.

Following is an explanation of the criteria used to determine the limitations or hazards.

Areas of rock outcrop—Rock outcrop is a named component of the map unit.

Areas of rubble land—Rubble land is a named component of the map unit.

Boulders—The terms describing the texture within a depth of 24 inches include a bouldery modifier, or the soil is a bouldery phase.

Depth to rock—Hard bedrock is within a depth of 60 inches.

Dustiness—The surface layer is silt, silt loam, loam, or very fine sandy loam.

Erosion by water—The surface K factor multiplied by the upper slope limit is more than 10.

Flooding—The component of the map unit is occasionally flooded or frequently flooded.

Low soil strength—The component of the map unit has one of the following Unified classifications (ASTM, 1988) within the 60-inch profile: ML, CL, MH, CH, OL, PT, or GC.

Shrink-swell potential—The component of the map unit has a high shrink-swell potential in a layer that is at least 10-inches thick and is within 40 inches of the surface.

Slope—The upper slope limit is more than 35 percent.

Slumping—The component of the map unit meets the requirements for low soil strength and has slopes of more than 35 percent.

Stones—The terms describing the texture within a depth of 24 inches include a very stony or extremely stony modifier or the soil is a very stony or extremely stony phase.

Water table—The component of the map unit has a water table within a depth of 60 inches.

Forestland of Carter County

Robert D. Logar, State Forester, Natural Resources Conservation Service, prepared this section.

The total acreage within Carter County is 2,139,300. Of this amount, approximately 5 percent, or 112,322 acres, is forested. The commercial forestland is generally of low productivity, producing less than 50 cubic feet per acre per year. In 1989, the net volume of sawtimber was estimated to be 69,217,000 board feet; 85 percent of which was softwood timber. Eighty-two percent of the estimated timber volume is on private land. Though timber harvesting has increased over the years, low productivity and small tree diameters limit the sawtimber volume available. Approximately 2,407,000 board feet of sawtimber is removed annually. Of this amount, approximately 59 percent (1,421,000 board feet) is on nonindustrial private forestland, and 41 percent (986,000 board feet) is on national forestland. Net annual growth of sawtimber is about 2,239,000 board feet. The area has an annual mortality of about 394,000 board feet of sawtimber (Conner, 1993; O'Brien, 1991; Montana Department of State Lands, 1984*).*

Forestland in the county is protected from fire by the Montana Department of State Lands, Division of Forestry, and local fire districts. In July 1988, the Brewer Fire occurred, affecting approximately 58,300 acres, or 83 percent, of the Long Pine Hills in eastern Carter County. Approximately 19,600 acres were of high intensity burn; 16,600 acres were medium intensity burn; and 22,100 acres were low intensity burn.

Soils vary in their ability to support tree growth. This ability is influenced by available water capacity, depth, fertility, and texture. Growth rates and the kinds of trees expected on a site are determined by aspect, climate, elevation, and soils. Forested soils in the county range from shallow to very deep, from nongravelly to extremely gravelly, and from fine textured to coarse textured. Forests vary in composition and productivity due to differences in soils, as well as differences in climate, geology, and topography.

Coniferous forestland is mainly in the Boyes, Chalk Buttes, Ekalaka Hills, and Long Pine Hills areas. Boyes is in the southwestern corner of the county; the Chalk Buttes are south and west of Ekalaka; the Ekalaka Hills are around the town of Ekalaka; and the Long Pine Hills are in the eastern part of the county. Elevations range from about 2,760 to 4,450 feet.

Ponderosa pine is the primary cover type for the area. Cover types of bur oak, green ash, plains cottonwood, and quaking aspen also occur but in lesser amounts of acreage.

Forested areas are generally associated with the Arikaree geologic formation. This formation is up to 250-feet thick and forms resistant bluffs in the Chalk Buttes, Ekalaka Hills, and Long Pine Hills. The Arikaree Formation consists of light colored,

tuffaceous sandstone and shales with interbedded volcanic ash. The residuum forms sandy textured soils.

Ponderosa pine is in the 15- to 19-inch precipitation zone. Associated soils in the Chalk Buttes, Ekalaka Hills, and Long Pine Hills are the Belltower, Dast, and Vebar soil series. The Boyes area is associated with the Broadus, Reeder, and Ridge soil series.

Understory plant communities of these areas vary with aspect, overstory canopy density, precipitation, soil types, and steepness of slope. Generally, plant communities on slopes less than 20 percent, and on steeper north-facing slopes, consist of Columbia needlegrass, common chokecherry, common juniper, common snowberry, kinnikinnick, northern bedstraw, Oregongrape, and timber danthonia. Understories associated with steeper southerly aspects are dominated by common chokecherry, little bluestem, sideoats grama, skunkbush sumac, sun sedge, and western wheatgrass.

Deciduous tree species, such as boxelder, green ash, and plains cottonwood, are located throughout the county in 10- to 14-inch precipitation zones. Green ash and plains cottonwood are largely confined to the riparian areas associated with larger drainages such as Box Elder Creek and the Little Missouri River. Green ash is associated with the cottonwood and boxelder areas; however, it also dominates riparian plant communities along smaller drainageways and occurs on well-drained soils of steeper northerly aspects. Boxelder, green ash, and plains cottonwood cover types are associated mainly with the Harlake and Havre soil series. Bur oak is intermixed with green ash along the Little Missouri River in the Alzada area. Green ash is intermixed with ponderosa pine on uplands in the same area.

Generally, forested areas with deciduous tree species occur on the occasionally flooded phases of Harlake and Havre soils. The understory is predominantly shrubs. Rarely flooded phases of these series are occasionally forested with deciduous trees. Trees have been cleared from much of the rarely flooded and some of the occasionally flooded alluvial soil areas.

Quaking aspen occur in random wet areas throughout the county in the 15- to 19-inch precipitation zone and are considered noncommercial forestland in Carter County. They mostly occur on wetter minor components in map units of the Belltower, Dast, and Vebar soil series. These minor components have moderate to high available water capacity and are located in positions receiving extra moisture as run-in. The understory plant community consists of common chokecherry and common snowberry.

Ratings for the “Forestland Management” table were made on the basis of timber having been harvested by the clear-cut method and slash burned. It is assumed reasonable care was used in logging so funneling of skid trails did not occur to concentrate water, that excessive disturbance did not occur, and that the coarser material from slash disposal remained.

Seedling mortality ratings for this county apply to planting stock 1 or 2 years old, with the evaluation period beginning at the time of planting. For natural regeneration, the evaluation period was considered to begin 1 year after germination.

Windthrow hazard ratings for soils on north slopes that remain moist into the spring, and those having a high basal area limiting root development, were considered moderately prone to windthrow even though the soil materials provided a good anchoring medium for tree roots. On drier sites, clayey soils without rock fragments were also considered in this category. Soils having a high water table (within 20 inches of the surface) long enough to inhibit root development were considered to be severely susceptible to windthrow.

In ratings for plant competition, if adequate regeneration usually occurred on a soil within 5 years, the limitation was considered slight.

In the “Forestland Productivity” table, productivity ratings were made using the site index base age of 30 years for plains cottonwood, 80 years for quaking aspen, and 100 years for ponderosa pine. Due to these age differences, site index values are not directly comparable from one species to another. Site index values were computed from the following references: ponderosa pine (Meyer, 1938), quaking aspen (Baker, 1925), and plains cottonwood (locally adapted site index curves developed by the Natural Resources Conservation Service were used).

For most species, yield estimates were determined from the average annual yield versus site index curves. Yields were developed through the adjustment of data presented in the published yield tables of several different sources. Average annual yield values were computed at the culmination of mean annual increment.

“Even-aged Stands of Ponderosa Pine” (Meyer, 1938) was used for estimating yields of ponderosa pine. Board-foot volumes are based on Scribner’s log rule and include all trees larger than 10-inch diameter breast height to an 8-inch top diameter inside bark (Dahms, 1964). “Aspen in the Central Rocky Mountain Region” (Baker, 1925) was used to

estimate quaking aspen yields. Total cubic-foot volume estimates in the reference are based on all trees more than 4-inch diameter breast height. Plains cottonwood yields were based on data collected by the Natural Resources Conservation Service.

Equipment limitations for the “Main Forest Access Road Limitations and Hazards” table are related to logging operations. Of prime consideration were difficulties encountered in yarding logs and the influence of logging activities on soil properties. Primary soil features considered for this rating were seasonal soil wetness, slope, soil depth, soil texture, and stoniness.

Recreation

Soils of the survey area are rated in the "Recreational Development" table according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. Soils are rated based on soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. Soils are rated based on soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an adequate cover of vegetation. Soils are rated based on soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. These areas should require little or no cutting and filling during site preparation. Soils are rated based on soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, not dusty when dry, and not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight*.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal

high water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

The information in the “Recreational Development” table can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in the “Building Site Development” table and interpretations for septic tank absorption fields in the “Sanitary Facilities” table.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Elements of Wildlife Habitat

The following paragraphs describe the elements of wildlife habitat.

Grain and seed crops are domestic grains and seed-producing herbaceous plants used by wildlife. Examples of these crops are barley, oats, rye, and wheat.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples of grasses and legumes are alfalfa, bromegrass, clover, crownvetch, fescue, orchardgrass, reed canarygrass, timothy, and trefoil.

Wild herbaceous plants are native or naturally established forbs and grasses, including weeds, that provide food and cover for wildlife. Examples of wild herbaceous plants are blackberry, blueberry, bluestem, dandelion, fescue, goldenrod, Indiangrass, lambsquarters, nightshade, ragweed, and wheatgrass.

The major soil properties affecting the growth of forage and grain crops and wild herbaceous plants are amount of water available to plants, depth of the root zone, flooding, salinity or sodicity, texture of the surface layer, and wetness. The length of the growing season also is important.

Deciduous trees and woody understory produce bark, buds, catkins, foliage, nuts or other fruit, and twigs that wildlife eat. Examples of deciduous trees and woody understory are American elm, birch, boxelder, green ash, maple, oak, poplar, and willow. Examples of fruit-producing shrubs are American plum, chokecherry, crabapple, hawthorn, honeysuckle, redosier dogwood, serviceberry, and silver buffaloberry.

Coniferous plants are cone-bearing trees, ground covers, or shrubs that provide habitat or supply food in the form of browse, fruitlike cones, or seed. Examples of coniferous plants are cedar, fir, hemlock, juniper, larch, pine, spruce, and yew.

The major soil properties affecting the growth of coniferous and deciduous trees and shrubs are amount of water available to plants, depth of the root zone, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Wetland plants produce food or cover for wetland wildlife. Examples of wetland plants are arrowhead, bulrush, cattail, millet, pickerelweed, rush, sedge, smartweed, waterplantain, and wildrice.

The major soil properties affecting wetland plants are acidity or alkalinity, slope, texture of the surface layer, and wetness.

Shallow-water areas have an average depth of less than 5 feet. These areas, either naturally wet or created by dams, levees, or water-control measures in marshes or streams, are useful as habitat for some wildlife species. Examples of shallow-water areas are beaver ponds and other wildlife ponds, muskrat marshes, waterfowl feeding areas, and wildlife watering developments.

The major soil properties affecting shallow-water areas are depth to bedrock, permeability, slope, surface stoniness, and wetness.

Kinds of Wildlife Habitat

Habitat for openland wildlife consists of cropland, meadows, pasture, and other areas that are overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to openland areas include cottontail rabbit, field sparrow, Hungarian partridge, killdeer, meadowlark, pheasant, red fox, sage grouse, and sharp-tailed grouse.

Habitat for woodland wildlife consists of areas of coniferous or deciduous trees and shrubs or a mixture of these and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to woodland areas include black bear, deer, elk, owl, porcupine, raccoon, ruffed grouse, thrush, tree squirrel, wild turkey, and woodpecker.

Habitat for wetland wildlife consists of open, marshy or swampy, shallow-water areas that support water-tolerant plants. Wildlife attracted to wetland areas include beaver, bittern, duck, geese, heron, kingfisher, mink, muskrat, otter, and rail.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland areas include antelope, deer, lark bunting, meadowlark, and sage grouse.

Wildlife of Carter County

Carter County provides a variety of habitats for wildlife, including brushy draws, croplands, ponderosa pine woodlands, ponds, rangelands, reservoirs, rough breaks, and streams.

Mule deer, white-tailed deer, and pronghorn antelope inhabit the county. Mule deer occur in many of the breaks, brushy draws, and rangelands. White-tailed deer inhabit the bottomlands along Box Elder Creek, the Little Missouri River, and the Custer National Forest. Pronghorn antelope occur on prairie grasslands.

The bottomlands of Box Elder Creek and the Little Missouri River support habitat, in the form of brushy draws, croplands, ditchbanks, and riparian thickets, for ring-necked pheasant.

Hungarian partridge, an introduced game bird from Europe, is associated with croplands and grasslands throughout the county. The Hungarian partridge shares its range with the native sharp-tailed grouse. Sharp-tailed grouse occur throughout the prairie uplands where brushy thickets, with an abundance of fruit-bearing shrubs, provide quality habitat.

Sage grouse are scattered throughout much of Carter County on sagebrush-covered rangelands. Communities of big sagebrush and silver sagebrush, with a variety of forbs and grasses, characterize optimum sage grouse habitat.

Turkeys inhabit the wooded draws and uplands throughout the county. Vegetative cover consists of ponderosa pine and deciduous trees and brush in scattered small openings and drainageways. Turkeys were introduced into the Long Pine Hills, near Capitol Rock, in 1955.

Many marshes, ponds, potholes, and reservoirs scattered throughout the county provide habitat for waterfowl during both spring and fall migrations and during the summer production period.

Beaver, mink, and muskrat inhabit the many creeks and intermittent streams of the county. Badger, bobcat, coyote, fox, and a variety of small mammals occur throughout the county.

Populations of game and nongame species can be enhanced through the application of conservation practices to improve habitat. Among these practices are the development of odd or irregularly shaped areas in or near farmland to provide food and cover. Protection of habitat areas from fire or grazing and the establishment of woody vegetation assist in the habitat improvement process. Wildlife habitat may also be enhanced through the application of commonly employed conservation practices, such as the construction of ponds, minimum tillage, planned grazing systems, shelterbelts, and windbreaks.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. Ratings are based on observed soil performance and on estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

Additional interpretations can be made using the information in the tables, along with soil maps, soil descriptions, and other data provided in this survey.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

The "Building Site Development" table shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. Limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, open ditches, utility lines, and other purposes. Ratings are based on soil properties, site features, and observed soil performance. Ease of digging,

filling, and compacting is affected by the depth to bedrock, to a cemented pan, or to a very firm dense layer; stone content; soil texture; and slope. Depth to a seasonal high water table and susceptibility of the soil to flooding affect the time of year that excavations can be made. Soil texture and depth to the water table affect the resistance of the excavation walls or banks to sloughing or caving.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for dwellings without basements, dwellings with basements, and small commercial buildings without basements. Ratings are based on soil properties, site features, and observed soil performance. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. Ratings are based on soil properties, site features, and observed soil performance. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Ratings are based on soil properties, site features, and observed soil performance. Soil reaction; a high water table; depth to bedrock or to a cemented pan; available water capacity in the upper 40 inches; and content of salts, sodium, and sulfidic materials affect plant growth. Flooding; wetness; slope; stoniness; and amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

The “Sanitary Facilities” table shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. This table also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of *slight, moderate,* or *severe* are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of *good, fair,* and *poor* are given for daily cover for landfill.

A rating of *slight* or *good* indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of *moderate* or *fair* indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of *severe* or *poor* indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. Soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

Ratings are based on soil properties, site features, and observed soil performance. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock, or a cemented pan, interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a

nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

The "Sanitary Facilities" table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. Ratings are based on soil properties, site features, and observed soil performance. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Trench sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. Waste is spread, compacted, and covered daily with a thin layer of soil, excavated from the trench. When the trench is full, a final cover of soil material at least 2-feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

Area sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. Waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2-feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ratings in the "Sanitary Facilities" table are based on soil properties, site features, and observed soil performance. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. Soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. Soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, the most organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They are also important when soil is used as a medium for treatment and disposal of organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

Use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area, then environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste; municipal sewage sludge; use of wastewater

for irrigation; and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available from local Natural Resources Conservation Service or Cooperative Extension Service offices.

Construction Materials

The "Construction Materials" table gives information about the soils as a source of roadfill, sand, gravel, and topsoil. Soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In the "Construction Materials" table, soils are rated as a source of roadfill for low embankments, generally less than 6-feet high and less exacting in design than higher embankments.

Ratings are for soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The "Engineering Index Properties" table provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. Soil performance after it is stabilized with lime or cement is not considered in the ratings.

Ratings are based on soil properties, site features, and observed soil performance. Thickness of suitable material is a major consideration. Ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, slopes of more than 25 percent, or a water table at a depth of less than 1 foot. They may have layers of suitable material, but it is less than 3-feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the "Construction Materials" table, only the probability of finding material in suitable quantity in or below the soil is evaluated. Suitability of the material for specific purposes is not evaluated nor are factors that affect excavation of the material.

Properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), thickness of suitable material, and content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the "Engineering Index Properties" table.

A soil rated as a *probable* source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3-feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an *improbable* source. Fragments of soft bedrock, such as shale and siltstone, are not considered sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Reclamation potential of the borrow area is also evaluated.

Toxic material and such properties as soil reaction, available water capacity, and fertility affect plant growth. Slope, the water table, rock fragments, soil texture, and thickness of suitable material affect ease of excavating, loading, and spreading. Slope, the water table, rock fragments, bedrock, and toxic material affect reclamation of the borrow area.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils; loamy soils that have a relatively high content of clay; soils that have only 20 to 40 inches of suitable material; soils that have an appreciable amount of gravel, stones, or soluble salts; or soils that have slopes of 8 to 15 percent. Soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey; have less than 20 inches of suitable material; have a large amount of gravel, stones, or soluble salts; have slopes of more than 15 percent; or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

The "Water Management" table gives information about soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. Limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. Seepage potential is determined by permeability of the soil and depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20-feet high, constructed to impound water or to protect land against overflow. In the "Water Management" table, soils are rated as a source of material for embankment fill. Ratings apply to soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

Ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material and trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil affect excavated ponds. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving affect excavating and grading and the stability of ditchbanks. Productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. Depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope affect the design and management of an irrigation system. Large stones and depth to bedrock or to a cemented pan affect the construction of a system. Depth of the root zone, the amount of salts or sodium, and soil reaction affect the performance of a system.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. Restricted rooting depth, severe hazard of soil blowing or water erosion, excessively coarse texture,

and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of a soil survey. Data and estimates of soil and water features, listed in the tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

Estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

The "Engineering Index Properties" table gives estimates of the engineering classification and of the range of index properties for major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. Soil series descriptions in Part I of this survey give the range in depth and information on other properties of each layer.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1988) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 based on grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 based on visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 3 to 10 inches in diameter and larger than 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area, or from nearby areas, and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

The "Physical Properties of the Soils" and "Chemical Properties of the Soils" tables show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

The following paragraphs describe the columns in the "Physical Properties of the Soils" table.

Depth to the upper and lower boundaries of each layer is indicated. Range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the largest to the smallest.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the "Physical Properties of the Soils" table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. Capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the

change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated based on the kind and amount of clay minerals in the soil and on measurements of similar soils.

Linear extensibility is used to determine the *shrink-swell potential* of soils. The shrink-swell potential is *low* if the soil has a linear extensibility of less than 3 percent, *moderate* if 3 to 6 percent, *high* if 6 to 9 percent, and *very high* if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design is often needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the "Physical Properties of the Soils" table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. It affects the available water capacity, infiltration rate, and tilth. Organic matter is a source of nitrogen and other nutrients for crops.

Erosion factors are shown in the "Physical Properties of the Soils" table as the K factor (K and Kf) and the T factor. *Erosion factor K* indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor K indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility of soils to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if measures to control soil blowing are used.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if ordinary measures to control soil blowing are used.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. They are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
8. Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to soil blowing, or the tons per acre per year that can be expected to be lost to soil blowing. There is a close correlation between soil blowing and the size and durability of

surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence soil blowing.

The following paragraphs describe the columns in the "Chemical Properties of the Soils" table.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the soil. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is given as the percent, by weight, of hydrated calcium sulfates in the soil. Gypsum is partially soluble in water and can be dissolved and removed by water. Soils that have a high content of gypsum (more than 10 percent) may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation; it is expressed, in millimhos per centimeter at 25 degrees C, as the electrical conductivity of the saturation extract. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by irrigation water quality and by water application frequency. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio is the measure of sodium relative to calcium and magnesium in the water extracted from saturated soil paste. Soils having a sodium adsorption ratio of 13 or more may be characterized by increased dispersion of organic matter and clay particles, reduced permeability and aeration, and general degradation of soil structure.

Water Features

The "Water Features" table gives estimates of several important water features used in land-use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. Soil properties affecting the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include depth to a seasonal high water table, intake rate, permeability after prolonged wetting, and depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. They consist chiefly of very deep, well-drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. They consist chiefly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. They consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. They consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near

the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered ponding.

The "Water Features" table gives the frequency and duration of flooding and the time of the year when flooding is most likely to occur. *Frequency*, *duration*, and probable *months* of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year).

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). The time of year when flooding is most likely to occur is expressed in *months*. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is a zone of saturation at the highest average depth during the wettest season. It is at least 6-inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in the "Water Features" table are *water table depth, kind of water table*, and *months* of the year when the water table usually is highest.

Two numbers in the column, *water table depth*, indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates the water table is above the surface of the soil. *> than 6.0* indicates the water table is below a depth of 6 feet or it is within a depth of 6 feet for less than a month.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time is allowed for adjustments in the surrounding soil.

A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Ponding is standing water in marshes and swamps or in closed depressions. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation.

Soil Features

The "Soil Features" table gives estimates of several important soil features used in land-use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

A *cemented pan* is a cemented or indurated subsurface layer within a depth of 5 feet. The particles are held together by cementing substances, such as calcium carbonate and oxides of silicon, iron, or aluminum. Such a pan causes difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3-inches thick if continuously indurated or less than 18-inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3-inches thick if continuously indurated or more than 18-inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. It generally results from either desiccation and shrinkage or oxidation of organic material, or both,

following drainage. Subsidence takes place gradually, usually over a period of several years. The "Soil Features" table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well-drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates the soil is rarely susceptible to formation of ice lenses; a *moderate* potential indicates the soil is susceptible to formation of ice lenses, resulting in frost heave and subsequent loss of soil strength; and a *high* potential indicates the soil is highly susceptible to formation of ice lenses, resulting in frost heave and subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The corrosion rate of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The corrosion rate of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and soil acidity.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For *uncoated steel*, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For *concrete*, the risk of corrosion, also expressed as *low, moderate,* or *high,* is based on soil texture, acidity, and amount of sulfates in the saturation extract.

References

Alexander, R.R. 1967. Site indexes for Engelmann spruce. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station Research Paper, RP-32.

American Association of State Highway and Transportation Officials (AASHTO). 1986. Standard specifications for highway materials and methods of sampling and testing. 14th edition, 2 volumes.

American Society for Testing and Materials (ASTM). 1988. Standard test method for classification of soils for engineering purposes. ASTM Standard D 2487-00.

Baker, F.S. 1925. Aspen in the Central Rocky Mountain Region. United States Department of Agriculture Bulletin 1291.

Brickell, J.E. 1968. A method for constructing site index curves from measurements of tree age and height—Its application to inland Douglas-fir. U.S. Department of Agriculture, Forest Service, Intermountain Research Station Research Paper INT-RP-47.

Brown, P.L., and G.R. Carlson. 1990. Grain yields related to stored soil water and growing season rainfall. Montana Agricultural Experiment Station Special Report Number 35.

Colton, R.B., R.W. Lemke, W. Richard, and R.M. Lindvall. 1961. Glacial map of Montana east of the Rocky Mountains. U.S. Geological Survey geologic map (1:500,000), I-0327.

Conner, R.C. 1993. Montana's forest resources. U.S. Department of Agriculture, Forest Service, Intermountain Research Station Resource Bulletin INT-RB-81.

Dahms, W.G. 1964. Gross and net yield tables for lodgepole pine. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR, Research Paper PNW-8.

Meyer, W.H. 1938. Yield of even-aged stands of ponderosa pine. U.S. Department of Agriculture, Technical Bulletin 630. Washington, DC.

Miller, M.R., W.M. Bermel, R.N. Bergantino, J.L. Sonderegger, P.M. Norbeck, and F.A. Schmidt. 1977. Compilation of hydrogeological data for southeastern Montana: Montana Bureau of Mines and Geology Open File Report 026.

Montana Department of State Lands, Division of Forestry, and U.S. Department of Agriculture, Forest Survey, Intermountain Forest and Range Experiment Station, Region 1. 1984. Timber resources of Eastern Montana. Working Circles 4, 5, 6, 7, and 8.

Myers, C.A. 1966. Yield tables for managed stands with special reference to the Black Hills. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station Research Paper RM-RP-21.

O'Brien R.A., and D.C. Collins. 1991. Forest statistics for land outside national forests in Eastern Montana, 1989. U.S. Department of Agriculture, Intermountain Research Station Research Bulletin INT-RB-71.

Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby. 1977. Forest habitat types of Montana. U.S. Department of Agriculture, Forest Service, Intermountain Research Station General Technical Report INT-GTR-34.

Sauerwein, W.J. 1979. Site index for black cottonwood. Compiled from British Columbia Forest Service data. U.S. Department of Agriculture, Soil Conservation Service, Western Region.

Soil Survey Division Staff. 1962. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 1990. Keys to soil taxonomy. 4th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

United States Department of Agriculture, Natural Resources Conservation Service. Montana Field Office Technical Guide, Section II.

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

United States Department of Agriculture, Soil Conservation Service. 1976. National range handbook.

Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. (See Sodic (alkali) soil.)

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hillslopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redox feature.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redox features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	more than 7.5

Avalanche chute. The track or path formed by an avalanche.

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes. Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular

to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding planes. Fine strata, less than 5-millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of cobbles or gravel. In some blowouts, the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Bouldery. Refers to a soil with .01 to 0.1 percent of the surface covered with boulders.

Bouldery soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments larger than 24 inches (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil material. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque. A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeters in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

COLE (coefficient of linear extensibility). (See Linear extensibility.)

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forestland capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse-grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer-textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion. In areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to

compression. Terms describing consistence are defined in the "Soil Survey Manual" (Soil Survey Division Staff, 1962).

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown, and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.
Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well-drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.
Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.
Poorly drained.—These soils commonly are so wet, at or near the surface, during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.
Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well-preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Footslope. The geomorphic component that forms the inner, gently inclined surface at the base of a hillslope. The surface profile is dominantly concave. In terms of gradational processes, a footslope is a transitional zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Giant ripple mark. The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in

wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Soil that is 15 to 35 percent, by volume, rounded or angular rock fragments up to 3 inches (7.6 centimeters) in diameter. Very gravelly soil is 35 to 60 percent gravel, and extremely gravelly soil is more than 60 percent gravel by volume.

Grazeable forestland. Land capable of sustaining livestock grazing by producing forage of sufficient quantity during one or more stages of secondary forest succession.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual" (Soil Survey Division Staff, 1962). The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A or E horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well-sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine-grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redox concentration.

Mean annual increment (MAI). The average annual increase in volume of a tree during its entire life.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Areas of color that differ from the matrix color. These colors are commonly attributes retained from the geologic parent material. (See Redox features for indications of poor aeration and impeded drainage.)

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well-decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Naturalized pasture. Forestland that is used primarily for the production of forage for grazing by livestock rather than for the production of wood products. Overstory trees are removed or managed to promote the native and introduced understory vegetation occurring on the site. This vegetation is managed for its forage value through the use of grazing management principles.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots.

For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile.

Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit. The range of moisture content within which the soil remains plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse-grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential natural community (PNC). The biotic community that would become established on an ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development. The PNC may include acclimatized or naturalized nonnative species.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the

potential natural plant community for that site. (See Similarity index.)

Range site. (See Ecological site.)

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redox concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redox depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redox features. Redox concentrations, redox depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redox feature.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, boulders, stones, cobbles, and gravel.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called

ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder. The uppermost inclined surface at the top of a hillside. It is the transitional zone from the backslope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay

(0.002 millimeters) to the lower limit of very fine sand (0.05 millimeters). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Similarity index. A similarity index is the percentage of a specific vegetation state plant community that is presently on the site.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from

saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with tillage, or stones cover .01 to 0.1 percent of the surface. Very stony means that 0.1 to 3.0 percent of the surface is covered with stones. Extremely stony means that 3 to 15 percent of the surface is covered with stones.

Stony soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Terracette. Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may or may not be induced by trampling of livestock such as sheep or cattle.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive, nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes are commonly gentle and linear in profile.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a

sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water-spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse-grained particles that are well distributed over wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

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Zoom to full extent to view
Section, Township, Range.

INDEX TO MAP SHEETS

CARTER COUNTY, MONTANA

Scale 1:380,160

1 0 1 2 3 4 5 6 Miles

1 0 6 12 Km

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

The publication symbols consist of field symbols. Symbols consist of numbers or a combination of numbers and letters, for example, 18A, 266D, 2, and 1823F. For the symbols designated by a number and a letter, the number designates the soil type and the letter designates the slope class. The symbols without a number designate a miscellaneous area. Map units are arranged numerically by field symbols.

SYMBOL	NAME
7B	Hanly-Ryell fine sandy loams, 0 to 4 percent slopes
13E	Rock outcrop
13F	Badland
14C	Carfall loam, 2 to 8 percent slopes
15C	Weingart silty clay, 2 to 8 percent slopes
17E	Ustochrepts-Haploborolls complex, slump, 15 to 45 percent slopes
20C	Alona silt loam, 2 to 8 percent slopes
21C	Parchin fine sandy loam, 2 to 8 percent slopes
22A	Varney loam, 0 to 2 percent slopes
22C	Varney loam, 2 to 8 percent slopes
23D	Tricart clay loam, 4 to 15 percent slopes
23E	Tricart gravelly loam, 15 to 45 percent slopes
30A	Beaverflat loam, 0 to 4 percent slopes
36A	Parshall sandy loam, 0 to 4 percent slopes
36D	Parshall fine sandy loam, 4 to 15 percent slopes
41C	Yegen loam, 2 to 8 percent slopes
41D	Yegen loam, 8 to 15 percent slopes
42C	Reeder loam, 2 to 8 percent slopes
45B	Daglum loam, 0 to 4 percent slopes
48D	Prego sandy loam, 2 to 15 percent slopes
49A	Beenom-Reeder loams, 1 to 4 percent slopes
51C	Abor silty clay loam, 2 to 8 percent slopes
53C	Orinoco silty clay loam, 2 to 8 percent slopes
54A	Creed loam, 0 to 2 percent slopes
54C	Creed loam, 2 to 8 percent slopes
55D	Blacksheep-Twilight fine sandy loams, 8 to 15 percent slopes
55E	Blacksheep-Twilight fine sandy loams, 15 to 45 percent slopes
56A	Havre loam, 0 to 2 percent slopes
57A	Harlake silty clay, saline, 0 to 2 percent slopes
58D	Neldore-Rock outcrop complex, 4 to 15 percent slopes
58E	Neldore-Rock outcrop complex, 15 to 45 percent slopes
59C	Ynot sandy loam, 2 to 8 percent slopes
59D	Ynot sandy loam, 8 to 15 percent slopes
60D	Cabbart silt loam, 4 to 15 percent slopes
61A	Glendive sandy loam, 0 to 2 percent slopes
64C	Tanna silty clay loam, 2 to 8 percent slopes
65A	Gerdrum clay loam, 0 to 2 percent slopes
65C	Gerdrum clay loam, 2 to 8 percent slopes
66C	Ethridge silty clay loam, 2 to 8 percent slopes
69C	Twilight fine sandy loam, 2 to 8 percent slopes
69D	Twilight fine sandy loam, 8 to 15 percent slopes
70C	Busby fine sandy loam, 2 to 8 percent slopes
70D	Busby fine sandy loam, 8 to 15 percent slopes
71C	Delpoint loam, 2 to 8 percent slopes
72A	Kremlin loam, 0 to 2 percent slopes
72C	Kremlin loam, 2 to 8 percent slopes
74A	Assinniboine sandy clay loam, 0 to 2 percent slopes
74C	Assinniboine sandy clay loam, 2 to 8 percent slopes
75A	Archin-Absher complex, 0 to 2 percent slopes
75C	Archin-Absher complex, 2 to 8 percent slopes
77D	Moyerson silty clay loam, 4 to 15 percent slopes
78A	Kobase silty clay loam, 0 to 2 percent slopes
78C	Kobase silty clay loam, 2 to 8 percent slopes
79C	Arsite clay, 0 to 8 percent slopes
81C	Marmarth loam, 2 to 8 percent slopes
83A	Chinook sandy loam, 0 to 2 percent slopes
83C	Chinook sandy loam, 2 to 8 percent slopes
83D	Chinook sandy loam, 8 to 15 percent slopes
84A	Eapa loam, 0 to 2 percent slopes
84C	Eapa loam, 2 to 8 percent slopes
84D	Eapa loam, 8 to 15 percent slopes
85A	Ethridge loam, 0 to 2 percent slopes
85C	Ethridge loam, 2 to 8 percent slopes
86A	Yamacall loam, 0 to 2 percent slopes
86C	Yamacall loam, 2 to 8 percent slopes
86D	Yamacall loam, 8 to 15 percent slopes
87A	Bickerdyke clay, 0 to 2 percent slopes
87C	Bickerdyke clay, 2 to 8 percent slopes
89A	Marvan silty clay, 0 to 2 percent slopes
89C	Marvan silty clay, 2 to 8 percent slopes
90C	Bascovy clay, 2 to 8 percent slopes
90D	Bascovy clay, 8 to 15 percent slopes
91C	Bonfri loam, 2 to 8 percent slopes
91D	Bonfri loam, 8 to 15 percent slopes
92C	Alzada clay loam, 2 to 8 percent slopes
94A	Marias silty clay loam, 0 to 2 percent slopes
94C	Marias silty clay loam, 2 to 8 percent slopes
95A	Teigen silty clay loam, 0 to 4 percent slopes
95D	Teigen clay loam, gullied, 4 to 15 percent slopes
96A	Vaeda silty clay loam, 0 to 2 percent slopes
97A	Vanda silty clay loam, 0 to 2 percent slopes
98C	Volborg clay, 2 to 8 percent slopes
99F	Rentsac-Twilight-Rock outcrop complex, 15 to 45 percent slopes
112D	Cabba silt loam, 8 to 15 percent slopes
114C	Carfall-Assinniboine complex, 2 to 8 percent slopes
114D	Carfall-Assinniboine complex, 8 to 15 percent slopes
116C	Beenom-Parchin complex, 2 to 8 percent slopes
119D	Zeona-Blacksheep-Rock outcrop complex, 4 to 15 percent slopes
121C	Parchin-Bullock complex, 2 to 8 percent slopes
122C	Varney-Gerdrum complex, 2 to 8 percent slopes
125F	Dast-Ridge-Rock outcrop complex, 35 to 60 percent slopes
126D	Broadus-Ridge-Reeder complex, 8 to 25 percent slopes
126F	Broadus-Ridge-Rock outcrop complex, 25 to 65 percent slopes
130A	Beaverflat sandy loam, 0 to 4 percent slopes
131C	Shambo-Noonan loams, 4 to 15 percent slopes
136D	Parshall-Cohagen fine sandy loams, 4 to 15 percent slopes
141C	Yegen-Rentsac complex, 2 to 8 percent slopes
142D	Reeder-Cabba loams, 4 to 15 percent slopes
144D	Belltower-Reeder-Vebar complex, 4 to 15 percent slopes
144E	Belltower-Dast-Reeder complex, 15 to 35 percent slopes
144F	Belltower-Dast complex, 35 to 60 percent slopes
152F	Mowbray-Cabba-Vebar complex, 35 to 60 percent slopes
153D	Orinoco-Yawdim silty clay loams, 4 to 15 percent slopes
154C	Creed-Absher complex, 2 to 8 percent slopes
155E	Blacksheep-Rock outcrop complex, 25 to 50 percent slopes
156A	Havre loam, saline, 0 to 2 percent slopes
157A	Harlake silty clay loam, 0 to 2 percent slopes
158D	Neldore clay, 4 to 15 percent slopes
158E	Neldore clay, 15 to 35 percent slopes
160D	Cambeth-Yamacall complex, 8 to 15 percent slopes
160E	Cabbart-Rock outcrop-Delpoint complex, 15 to 50 percent slopes
160F	Cabbart-Rock outcrop-Yawdim complex, 15 to 70 percent slopes
161B	Glendive sandy loam, saline, 0 to 4 percent slopes
162D	Yawdim silty clay loam, 4 to 15 percent slopes
164C	Tanna-Ethridge silty clay loams, 2 to 8 percent slopes
164D	Tanna-Ethridge silty clay loams, 8 to 15 percent slopes
165A	Gerdrum-Absher complex, 0 to 2 percent slopes
165C	Gerdrum-Absher complex, 2 to 8 percent slopes
167C	Eapa-Yamacall loams, 2 to 8 percent slopes
168B	Absher-Gerdrum complex, 0 to 4 percent slopes
170D	Busby-Blacksheep-Twilight fine sandy loams, 8 to 25 percent slopes
170E	Busby-Blacksheep-Rock outcrop complex, 8 to 25 percent slopes
171C	Delpoint-Cabbart complex, 2 to 8 percent slopes
171D	Delpoint-Cabbart complex, 8 to 15 percent slopes
172C	Kremlin-Cabbart complex, 2 to 8 percent slopes
174C	Assinniboine-Ynot complex, 2 to 8 percent slopes
175A	Archin loam, 0 to 2 percent slopes
175C	Archin loam, 2 to 8 percent slopes
176D	Kirby-Cabbart complex, 8 to 25 percent slopes
177E	Rock outcrop-Moyerson complex, 15 to 50 percent slopes
178C	Zatoville silty clay loam, 2 to 8 percent slopes
179E	Arsite-Rock outcrop complex, 8 to 25 percent slopes
183C	Chinook-Assinniboine complex, 2 to 8 percent slopes
184C	Eapa-Archin loams, 2 to 8 percent slopes
185A	Ethridge-Daglum complex, 0 to 4 percent slopes
186A	Yamacall-Havre loams, 0 to 2 percent slopes
186C	Yamacall-Havre loams, 2 to 8 percent slopes
191C	Bonfri-Cambeth complex, 2 to 8 percent slopes
193C	Yamacall-Cambeth complex, 2 to 8 percent slopes
196C	Vaeda-Creed complex, 0 to 4 percent slopes
197A	Vanda-Marvan complex, 0 to 2 percent slopes
197C	Vanda-Marvan complex, 2 to 8 percent slopes
198D	Volborg silty clay, saline, 4 to 15 percent slopes
212E	Cabba-Rock outcrop complex, 15 to 45 percent slopes
214C	Carfall fine sandy loam, 2 to 8 percent slopes
214D	Carfall fine sandy loam, 8 to 15 percent slopes
225E	Dast-Vebar complex, 15 to 35 percent slopes
225F	Dast-Vebar complex, 35 to 60 percent slopes
231D	Shambo-Mowbray-Parchin complex, 4 to 25 percent slopes
242D	Reeder-Dast complex, 4 to 15 percent slopes
251D	Abor-Yawdim silty clay loams, 4 to 15 percent slopes
253D	Orinoco-Weingart complex, 4 to 15 percent slopes
254C	Creed-Gerdrum complex, 2 to 8 percent slopes
256A	Havre-Harlake complex, 0 to 2 percent slopes
258D	Neldore-Volborg clays, 4 to 15 percent slopes
260C	Cambeth-Cabbart silt loams, 2 to 8 percent slopes
260D	Cabbart-Cambeth silt loams, 8 to 15 percent slopes
260E	Cambeth-Cabbart-Yawdim complex, 15 to 25 percent slopes
262E	Yawdim-Blacksheep-Rock outcrop complex, 15 to 45 percent slopes
269C	Twilight-Bonfri complex, 2 to 8 percent slopes
269D	Twilight-Bonfri complex, 8 to 15 percent slopes
270E	Busby, gullied-Delpoint-Yawdim complex, 8 to 25 percent slopes
271D	Delpoint-Yamacall loams, 8 to 15 percent slopes
275D	Archin, gullied-Delpoint complex, 4 to 15 percent slopes
276F	Kirby-Blacksheep-Rock outcrop complex, 25 to 60 percent slopes
277D	Moyerson-Orinoco silty clay loams, 4 to 15 percent slopes
283C	Chinook-Archin complex, 2 to 8 percent slopes
286C	Yamacall-Delpoint loams, 2 to 8 percent slopes
291D	Bonfri-Cabbart loams, 8 to 15 percent slopes
298E	Volborg-Julin-Rock outcrop complex, 8 to 25 percent slopes
312D	Cabba-Dast complex, 8 to 15 percent slopes
325E	Dast-Cabba-Mowbray complex, 15 to 35 percent slopes
358D	Neldore-Bascovy clays, 4 to 15 percent slopes
360D	Cabbart-Bascovy complex, 4 to 15 percent slopes
369C	Twilight-Delpoint complex, 2 to 8 percent slopes
369D	Twilight-Cabbart complex, 8 to 15 percent slopes
375C	Archin-Ynot complex, 2 to 8 percent slopes
386E	Yamacall-Cabbart loams, 15 to 35 percent slopes
391C	Bonfri-Parchin complex, 2 to 8 percent slopes
398E	Volborg-Volborg, saline-Rock outcrop complex, 8 to 45 percent slopes
477E	Moyerson silty clay loam, 15 to 35 percent slopes
490C	Bascovy-Ethridge complex, 2 to 8 percent slopes
586D	Yamacall-Delpoint-Cabbart loams, 8 to 15 percent slopes
590C	Bascovy-Marvan complex, 2 to 8 percent slopes
602C	Creed-Gerdrum complex, warm, 2 to 6 percent slopes
603C	Eapa loam, warm, 1 to 6 percent slopes
605E	Moyerson, warm-Rock outcrop complex, 9 to 45 percent slopes
606B	Harlake silty clay loam, warm, saline, 0 to 3 percent slopes
608B	Harlake clay, warm, 0 to 3 percent slopes
611B	Gerdrum-Absher complex, warm, 0 to 3 percent slopes
611D	Gerdrum-Absher complex, warm, 3 to 9 percent slopes
613B	Marvan-Vanda clays, warm, 0 to 3 percent slopes
614C	Marvan clay, warm, 0 to 6 percent slopes
620C	Weingart silty clay loam, warm, 0 to 6 percent slopes
621C	Alona silt loam, warm, 2 to 8 percent slopes
623D	Bascovy clay, warm, 0 to 9 percent slopes
625E	Neldore clay, warm, 3 to 25 percent slopes
626C	Ethridge silty clay loam, warm, 2 to 8 percent slopes
629C	Marmarth loam, warm, 2 to 8 percent slopes
631D	Orinoco-Yawdim silty clay loams, warm, 4 to 15 percent slopes
633D	Bascovy-Neldore clays, warm, 6 to 21 percent slopes
634E	Volborg-Julin complex, warm, 6 to 60 percent slopes
635C	Marvan-Bascovy clays, warm, 0 to 6 percent slopes
DA	Denied access
M-W	Miscellaneous water
W	Water

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

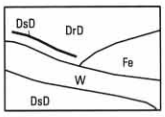
CARTER COUNTY, MONTANA

U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE
U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT
MONTANA AGRICULTURAL EXPERIMENT STATION

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

SOIL SURVEY FEATURES

SOIL DELINEATIONS AND SYMBOLS



Blowout

Escarpment, bedrock

Escarpment, nonbedrock

Gravel pit

Gravelly spot

Marsh or swamp

Mine or quarry

Rock outcrop

Saline spot

Short steep slope

Slide or slip

Sodic spot

Stony spot

Very stony spot

Wet spot

AD HOC FEATURES

Seep area

CULTURAL FEATURES

BOUNDARIES

National, state, or providence

County or parish

Reservation (national or state forest or park)

Map sheet neatline

Public land survey system section boundary

ROAD EMBLEMS & DESIGNATIONS

Federal

State

Symbol Definitions

LABEL	NAME	DESCRIPTION
	Blowout	A small saucer-, cup-, or trough-shaped hollow or depression formed by wind erosion on a preexisting sand deposit. Typically 1 to 5 acres.
	Escarpment, bedrock	A relatively continuous and steep slope or cliff, which was produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.
	Escarpment, nonbedrock	A relatively continuous and steep slope or cliff, which generally is produced by erosion but can be produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.
	Gravel pit	An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel. Typically 1 to 5 acres.
	Gravelly spot	A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area of surrounding soil with less than 15 percent fragments. Typically 1 to 5 acres.
	Marsh or swamp	A water-saturated, very poorly drained area, intermittently or permanently covered by water. Sedges, cattails, and rushes dominate marsh areas. Trees or shrubs dominate swamps. Not used in map units where the named components are “poorly drained” or “very poorly drained.” Typically 1 to 5 acres.
	Mine or quarry	An open excavation from which soil and underlying material are removed, exposing the bedrock. Also used to denote surface openings to underground mines. Typically 1 to 5 acres.
	Rock outcrop	An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit. Typically 1 to 5 acres.
	Saline spot	An area where the surface layer has an electrical conductivity (EC) of 8 mmhos cm-1 more than the surface layer of the named soils in the surrounding map unit, which have an EC of 2 mmhos cm-1 or less. Typically 1 to 5 acres.
	Seep area	A generally small area where water percolates slowly to the land surface. Typically less than 5 acres.
	Short, steep slope	Narrow soil area that has slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.
	Slide or slip	A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces. Typically 1 to 5 acres.
	Sodic spot	An area where the surface layer has a sodium adsorption ratio that is at least 10 more than the surface layer of the named soils in the surrounding map unit, which have a sodium adsorption ratio of 5 or less. Typically 1 to 5 acres.
	Stony spot	A spot where 0.01 to 0.10 percent of the surface cover is rock fragments that are greater than 10 inches in diameter in areas where the surrounding soil has no surface stones. Typically 1 to 5 acres.
	Very stony spot	A spot where 0.1 to 3.0 percent of the surface cover is rock fragments that are greater than 10 inches in diameter in areas where the surrounding soil has less than 0.01 percent of a surface cover of stones. Typically 1 to 5 acres.
	Wet spot	A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit. Typically 1 to 5 acres.